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# Psychiatric Treatment in Combat Areas

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PSYCHIATRIC casualties will be the inevitable result of the present fighting in Korea. We must apply the hard-won lessons of World War II in their treatment. The clinical course and prognosis of the combat neuroses are greatly influenced by group and social mechanisms. This fundamental point was forgotten in the opening phases of World War II, in the North African Campaign. Indiscriminate evacuation, crystallization of neuroses, and wastage of military manpower resulted. Sound administrative and organizational policies were afterwards instituted in Italy and Europe with dramatic success. They provided for treatment as far forward as possible. A *single* channel for evacuation of combat neuropsychiatric cases was set up, insuring centralized and positive control of screening, treatment, and evacuation. Emphasis was placed on preservation of medical discipline, shortening of the period of hospitalization, avoidance of unnecessary hospital atmosphere, and promotion in the patient of the expectation of return to full duty.[2] Stated in terms of psychodynamics, organization and administration of forward area psychiatry strove toward: (*a*) preservation of the patient's identification with the combat group; (*b*) minimization of the secondary gain of neurotic illness; and (*c*) avoidance of suggestion of illness and disability. Thus, therapeutic principles were implemented by group

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[2] These principles are now established as basic Army medical doctrine by Training Circular No. 6, Sec. I. Neuropsychiatric Casualties, 7 April 1950. Psychiatric teams to implement this program are provided in T/O & E 8-500, 2 March 1950 (Team KO: Psychiatric Detachment).

manipulation. The success of such measures was one of the most important medical lessons of World War II.

Soldiers who became psychiatric casualties on the battlefield received what may be called psychiatric first aid from members of their own combat unit. If evacuated from their unit, they were first seen in medical channels at the *Battalion Aid Station* where simple, but for many patients definitive, therapy was undertaken. A high percentage of patients were returned from this level to full duty. Those who were evacuated received further evaluation and treatment at the *Division Clearing Station*, where treatment was under the direction of the division psychiatrist. From 20 to 40 percent of all psychiatric casualties were returned to full duty from this point. Patients requiring more prolonged care and treatment and who were not considered salvageable for combat duty in the division within the time limits established were evacuated to the *Army Neuropsychiatric Treatment Station*, operating on evacuation hospital level under control of the Army surgeon. The latter station also received overloads from the division psychiatric facilities at times when casualties exceeded their capabilities. The Army Neuropsychiatric Treatment Stations held and treated patients for usually not more than 5 days. No psychiatric patients were evacuated from Army without passing through one of these installations. From 10 to 20 percent of all patients were returned to full combat duty from this level.[3]

Treatment methods at the Division Clearing Station and at the Army Neuropsychiatric Treatment Station did not differ markedly. Both rendered definitive care to a high percentage of patients evacuated to them. In the discussion of treatment methods which follows, they are considered together.

### TREATMENT WITHIN THE COMBAT UNIT

Unit personnel were the first to deal with the soldier with psychiatric complaints. The importance of their handling of the problem often went unrecognized, but was fully as great as that of surgical first aid. The most successful programs of forward area psychiatric treatment (e. g., in the 3d and 85th Infantry Divisions) placed much emphasis on indoctrination of company officers in proper methods of management of psychiatric complaints at this level. The division psychiatrist, 3d Infantry Division, outlined the principles to be followed to all infantry officers routinely at the time they first reported for duty in the division. A similar program was followed in the 85th Infantry Division.[4] In both of these divisions, indoctrination of

[3] Training Circular, No. 6, 7 April 1950.

[4] GLASS, A. H.: Psychiatry at the division level. Bull. U. S. Army M. Dept. (supp.). pp. 45–73, Nov. 1949.

company officers was continued during frequent visits of the division psychiatrist to individual units.

Proper first aid, either surgical or psychiatric, always entails an assessment of the severity of the patient's condition and a decision concerning the need for more definitive medical care. Consequently, company officers were instructed in the criteria to be followed in making such decisions in psychiatric problems, and were encouraged to develop confidence in their common-sense ability to "size up" patients with psychiatric complaints. It was a well-recognized principle of surgical first aid that soldiers with minor bruises or unimportant lacerations should not be evacuated. Rather, they were kept with their units and given what simple treatment was possible there. Similarly, it was held to be important that company officers not evacuate soldiers with relatively minor psychiatric problems. Such soldiers were much better handled by being given suitable superficial help within their own unit. Company officers encouraged wavering soldiers by exhortation and leadership, by counselling, reassuring, and by making alterations in job assignment in some cases. Thus soldiers with relatively minor complaints were prevented from entering medical channels where the dissolution of group ties, and the factors of secondary gain and suggestion would tend to fix their symptoms.

### AT BATTALION AID STATION LEVEL

The psychiatric casualty first encountered formal medical treatment (as opposed to "first aid") if he was evacuated to the Battalion Aid Station. Although the battalion surgeon was not a psychiatrist, his management of psychiatric casualties was of a degree of importance difficult to overestimate. Although accurate statistical records were not maintained by battalion surgeons, it has been estimated that at least 60 percent of all psychiatric patients were treated and returned to full duty at this level.[5]

A. *Treatment of fatigue, exhaustion, and effects of exposure.*— The major portion of psychiatric patients admitted to Battalion Aid Stations consisted of soldiers with from mild to moderate anxiety states complicated by physical exhaustion and the effects of exposure. These men were usually wet, cold, dirty, and physically worn out. Any judgment based on the first short interview with them was highly fallible. Although a man might appear to be at the end of his rope one evening, after a good night's rest under sedation in dry clothes and blankets in the luxury of a hayloft, he was often ready and willing

[5] TALBOT, C. C.: Psychiatric Treatment in the Battalion Aid Station. (Speech given at the Seventh Army Medical Conference, Nov. 1944.) Much of the section of this article which deals with the Battalion Aid Station draws heavily on a transcript of this speech.

to return to his company. Therefore, if at all feasible, borderline cases were kept in the vicinity of the aid station under medical management for 24 hours. The factor of adequate sedation of these acute cases cannot be overemphasized. Most were given from 0.36 to 0.55 grams of sodium amytal orally, or a corresponding dose of one of the other barbiturates. Every attempt was made to aid these soldiers in getting cleaned up, dry, and adequately fed.

It was usually found to be advisable to locate aid stations in buildings if possible because they provided more space for treatment and more apparent safety. It is advisable to say "apparent" because it was frequently noted that a tense, apprehensive rifleman would relax and sleep with a feeling of security under a roof and within four walls which the aid station personnel themselves hardly felt to constitute adequate shelter.

B. *Psychotherapy* at the Battalion Aid Station varied with the type of patient and was almost invariably, and of necessity, superficial. The attitude of the battalion surgeon was of prime importance in determining the outcome of the case. It was necessary that there be an air of calm confidence in all his decisions. Ideally, he was firm, yet understanding, so that all of his dispositions were regarded as final. His manner and all his remarks indicated that he expected an early return to duty of the soldier after he had rested. Medical discipline was maintained, and every effort was made to avoid allowing the aid station to become confused and crowded with men on doubtful status.

1. *Normal fear reactions.*—A large group of patients manifested symptoms that consisted essentially of no more than the somatic and psychologic manifestations of the normal combat fear reaction. These soldiers were treated by proper examination, evaluation, explanation, and reassurance. Although such management appears simple, mistakes were frequently made.[6] These patients were usually sincere. Most frequently they were replacements, or men returning to duty with their organizations after hospitalization. As combat approached, palpitation, nausea, tremulousness, and other somatic manifestations of the usual fear reactions began to manifest themselves. The soldier became alarmed and interpreted these symptoms as those of cardiac, gastrointestinal, or other physical disorders and reported to his medical officer.

It was always important that these patients not be slighted. They were given an examination involving the appropriate organ system. If this was negative, they were told so promptly and definitely. The cause of the symptoms was carefully explained to them, and they were

[6] RANSON, S. W.: Normal battle reaction; its relation to pathologic battle reaction Bull. U. S. Army M. Dept. (Supp.) pp. 3–11, Nov. 1949.

assured that there would be no lasting effects or disability. Sometimes it was of help to invite these men to inquire among their friends concerning their sensations. They were frequently surprised and pleased to find that they did not differ from the men who were carrying on without apparent concern. In any event, if it was possible to carry these men through the first few days of combat, they became acclimated and stopped coming to the aid station.

2. *Mild to moderate anxiety states.*—Patients with from mild to moderate anxiety states with varying degrees of exhaustion and exposure, were treated chiefly by sedation and by measures designed to counteract fatigue and exposure, as outlined above. Psychotherapy, which was superficial, consisted of reassurance, support, and exhortation. After 24 hours many of these patients felt completely recovered or markedly improved and could be returned directly to duty. Others showed little, or insufficient improvement, and were evacuated for further definitive care by the division psychiatrist.

3. *Severe neurotic reactions and psychoses.*—Certain patients were obviously unsuited for management in the Battalion Aid Station. These exhibited disturbed anxiety states with severe agitation and tension; acute panic states; severe hysterical manifestations; and acute psychoses. Although evacuation was the only conceivable disposition for such patients, it was found to be a great mistake simply to pack them into an ambulance and ship them to the rear. It was important that they be adequately sedated to render their evacuation feasible and nontraumatic. The most important consideration was to protect the patient from further psychic trauma in transit. Tense, disturbed soldiers with battle incurred anxiety reactions had a greater than usual tolerance for barbiturates and a much lower than usual threshold for pathologic reactions to combat stimuli. The dose of sedative, therefore, depended on the severity of the patient's reaction and the expected degree of enemy action or other psychic trauma to be encountered along the route of evacuation. The drugs most commonly used were the barbiturates, either orally or (in rare instances) parenterally. The most commonly used drug was sodium amytal in dosages of from 0.36 to 0.55 grams. It was found to be important that sedation be given in sufficient time to reach maximum effect before evacuation was undertaken. Care was taken to avoid converting a walking into a litter case by oversedation. Morphine and other opiates were less satisfactory than the barbiturates and their use was considered to be contraindicated.

4. *Administrative problems.*—Two other types of patients should be mentioned. Their proper management was of great importance in preservation of group morale. The return of patients of these types to full duty was mandatory. The so-called "gold bricks" be-

longed to this group of cases. These consisted of the true, simple malingerer and the soldier with some minor organic or functional condition which he exaggerated. Toward these men the attitude of the surgeon was of necessity one of uncompromising firmness. After a careful medical evaluation, he let the soldier know that he considered the situation trivial, and that it did not merit consideration of relief from duty. This was usually sufficient, but if the soldier persisted in his attitude or refused to accept the situation, reference to the possible consequences of such action usually discouraged further attempts. Habitual stragglers constituted another class of administrative problems requiring management by the battalion surgeon. These were the oh-so-willing soldiers who just could not keep up, or who got lost or misunderstood orders, or produced any number of other excuses leading to their arrival at the aid station when an attack was just getting under way or was momentarily expected. These men were best managed by providing instructions and when possible, guides or transportation back to the company in time to make or receive the attack. In this way, they came to realize that the subterfuge did not "pay off" and entailed only additional trouble and risk.

(*a*) *Kitchen and service trains.*—In the earlier phases of World War II, acute psychiatric patients frequently were sent to unit kitchens or service trains for rest, after which it was expected that they would return to duty. Although this practice was common at first in the 34th and other divisions in North Africa and Italy, many men not only did not improve under such conditions, but actually reported themselves to be worse and a great deal more tense. Some divisions (especially the 36th and 85th) set up regimental rest centers under the supervision of the regimental surgeon or dental surgeon. Such centers were more successful because they maintained good medical care and discipline—the degree depending largely on the attitude, ability, and insight of the medical officer in charge. Any type of rest without proper administrative control and medical supervision tended to fix symptoms and render return to duty less probable.

In summary, treatment at the Battalion Aid Station involved: (*a*) maintenance of good medical discipline; (*b*) the exhibition of an attitude of sympathetic firmness which expected return to full duty of most patients; (*c*) provision of proper rest and other measures designed to relieve fatigue and the effects of exposure; (*d*) treatment of as many patients as possible on duty status; and (*e*) adequate sedation, when indicated, with special emphasis on proper sedation of all patients evacuated to the rear from the aid station.[7]

[7] As general source material on this subject the following article is recommended. SOBEL, R.: Battalion surgeon as psychiatrist. Bull. U. S. Army M. Dept. (Supp.) pp. 36–44, Nov. 1949.

## AT DIVISION CLEARING STATION AND ARMY NEUROPSYCHIATRIC TREATMENT STATION LEVEL

If evacuated from a Battalion Aid Station, psychiatric patients were received by the division psychiatrist at the Division Clearing Station. At this level, definitive treatment of a large proportion of such patients was undertaken. Those unsuitable for treatment here, and those who had not responded to treatment, were evacuated to the Army Neuropsychiatric Treatment Station. Not infrequently, however, an excessively heavy case load forced the division psychiatrist to evacuate all types of patients, regardless of their suitability for treatment at division level. The Army Station served as a back-stop to the division psychiatrist. Therapy at Division Clearing Station and Army Neuropsychiatric Station levels were therefore interchangeable in a sense. Facilities for treatment were more elaborate at the Army Station, and definitive therapy was carried out in a higher percent of patients than at the Division Clearing Station. Essentially, however, differences in therapy at the two levels at various times resulted chiefly from fluctuations in the military situation, which by overloading the facilities of the division psychiatrist made it necessary for him to evacuate incompletely treated cases to the Army Station. Because the principles of treatment were essentially the same in both places, discussion of treatment at the two levels will be considered in a single section.

A. *Treatment for fatigue and exposure.*—Although a large percent had previously received some treatment for fatigue and exposure at Battalion Aid Stations, many arrived in a state of fatigue; they were cold, dirty, hungry, and worn-out. For these, rest under sedation was promptly instituted. They were placed in adequately heated tent wards, sleeping on cots, under a sufficient number of blankets. Hot food in copious quantities was made available. Most of them were given barbiturates by mouth.

B. *Alleviation of deprivations.*—These men had usually been subjected to many deprivations, both physical and psychologic. At the Division Clearing Station and the Army Neuropsychiatric Treatment Station an attempt was made to alleviate these to the fullest possible extent. The soldier was given a change of clothing, was encouraged to avail himself of the opportunity to shave with hot water, and to use the hot showers which were usually available. Recreational equipment and facilities were provided. Movies were often shown; reading and writing materials were at hand; and the patient was provided with cigarettes, candy, and personal items. Red Cross counselling and aid were available to soldiers with personal or family problems of a welfare nature. A chaplain was present for those who had felt

the lack of adequate contact with sources of religious support during combat.

C. *Psychotherapy.*—1. *The patient-physician relationship, and the history-taking situation.*—It was found to be important that the psychiatrist combine with an attitude of respect and sympathy for the patient, the qualities of firmness, decisiveness, and realism. The aim was to allow no doubt to arise in the patient's mind that he would be expected to return to full duty when capable of doing so. The technic of history taking was very important, both in obtaining proper understanding of the case, and as therapy in itself. It was essential that the examiner hear the patient out, and that the patient feel that he had received a fair hearing. If physical complaints were present, the organ system involved was carefully examined. Above all, no matter what the pressure of the situation, the psychiatrist avoided giving the patient a "brush-off." On the other hand, leading questions were always avoided because these patients were highly suggestible.

2. *Ventilation.*—Hearing these patients out, and allowing them to ventilate their fears, hopes, and resentments often brought symptomatic relief. The amount of material ventilated was frequently extraordinary. While it was being produced the psychiatrist strove to remain passive. During the course of such "talking-out," it was occasionally possible for the patient to formulate and work through his problems with a minimal degree of direction by the psychiatrist.

3. *Support of super-ego.*—Loyalty, and sense of duty to his buddies were among the most important supports of the soldier in combat. Invocation and strengthening of these forces were found to be of value in helping the wavering soldier to endure. The psychiatrist did not hesitate in properly chosen cases to call on the soldier's loyalty to his buddies and immediate combat group, and to point out the implications of his duty to support and defend his family. Although many soldiers responded to this type of appeal, calls on the soldier's loyalty to larger groups—the nation or the Army—were relatively less effective.

4. *Suggestion.*—Avoidance of suggestion of illness was reflected in the organization and atmosphere of treatment stations, and in the attitudes and actions of the psychiatrists. As much care was adopted to avoid suggestion of serious psychiatric illness, as of physical illness. The appointments and atmosphere of a conventional hospital were avoided to the fullest possible extent and Army and division psychiatric treatment facilities were made as much like ordinary Army leave or rest centers as was consistent with their medical mission. Except during the coldest of winter months, most division and army psychiatric treatment facilities were installed in tents rather than buildings. Patients slept on folding canvas cots, rather than beds, and neither mattresses nor sheets were provided. Patients therefore

slept in no greater luxury than personnel in leave or rest centers. There were no nurses, and all necessary ward care was administered by enlisted male orderlies, wearing regular O. D. or fatigue uniforms, not the white hospital orderly uniform. Patients remained in regular uniform; pajamas and convalescent suits were not issued.

Patients remained ambulatory and were not waited on except in the uncommon instances in which physical disease or disturbed behavior clearly necessitated it. Patients served themselves in the "chow line" for all meals, and went without assistance to the latrine. They made their own beds and policed the ward around their beds. All patients assisted in the performance of light work about the hospital on request.

All possible steps were taken to foster the expectation of return to full combat duty after a brief rest. Application of this principle was most highly developed at those division psychiatric treatment facilities which were organized as Treatment and Rehabilitation Centers. These were nonmedical installations, unprotected by the Geneva Convention. Their chief function, aside from treatment of psychiatric battle casualties, was to give physical training and battle indoctrination to replacements and soldiers returning to duty at the front from hospitals.

Both division and army psychiatric treatment facilities moved their entire patient load with them during all forward moves, whenever this was practicable. This avoided unnecessary transfer of patients to rearward installations, and fostered in the minds of patients the impression that they were probable candidates for return to full duty.

The psychiatrist in his contact with the patient avoided suggestion of organic or psychiatric illness. He maintained an attitude of firm kindliness, and avoided display of oversympathy and concern. In the opening phases of his examination, he generally concentrated on a realistic appraisal of the combat situation and the stresses to which the patient had been subject, rather than on the issue of illness. By patiently allowing the soldier to express himself without prompting, and by phrasing all questions in neutral terms, the examiner obtained a full and complete story of the present illness, uncomplicated by symptoms suggested by leading questions.

The psychiatrist also avoided unnecessary suggestion of illness by making organic diagnoses and rendering medical treatment as indicated, decisively. He avoided subjecting the patient to unnecessary referrals to others for special examinations, consultations, laboratory and x-ray work, and abstained from "passing the buck" by needlessly evacuating patients to rearward medical installations for diagnosis and treatment. It was repeatedly demonstrated that indecision, unnecessary referrals, unnecessary evacuations for "specialist opinion,"

and unnecessary special diagnostic procedures, firmly implanted the idea of illness in patients through suggestion, and by enhancing the secondary gain of illness. For the same reason, unnecessarily long stays in hospital were avoided, because to the patient they suggested continued and perhaps undiagnosed illness.

Not only was suggestion of illness avoided, but the positive suggestion was implanted that the patient was not seriously ill, that his symptoms would be alleviated, and that he would return to full combat duty. In the proper type of case, suggestion was used in an individual manner as a sharply directed tool, to eliminate specific hysterical symptoms. Direct suggestion was occasionally made, often accompanied by "laying on of hands" that a paraplegia would disappear, that a tic would cease, or that blindness would be replaced by normal vision. The symptom frequently vanished in a dramatic manner. Treatment confined to such suggestion did not significantly alter basic psychopathology. The symptom removed by pure suggestion often recurred, or was replaced after a short while by another hysterical symptom; or on removal of the symptom the patient might be flooded with anxiety.

Therefore, while direct suggestion was frequently employed in treatment of hysterical symptoms, it was usually combined with uncovering of amnestic material and abreaction, and manipulation of secondary gain. When properly combined with one or both of those tools, direct suggestion was therapeutically valuable. In general, any uncovering therapy that was not supplemented by positive direct suggestion, did not attain its full therapeutic possibilities.

5. *Uncovering therapy* in forward area military psychiatry was directed chiefly toward the recovery of repressed traumatic battlefield experiences. Such material was occasionally recovered in the course of ordinary therapeutic interviews as the result of firm suggestion by the psychiatrist that the patient would now be able to recall his forgotten experiences. In the event of such recovery of repressed material, there was frequently much simultaneous release of emotion (abreaction).

(*a*) *Uncovering therapy with intravenous barbiturates.*—In general, nonmanipulative uncovering technics were too time-consuming to be feasible in the forward area situation, and reliance was placed chiefly on uncovering technics using intravenous barbiturates ("narcosynthesis," "narcoanalysis") or hypnosis. In the European and Mediterranean Theaters, the technics employed generally included the use of some type of narcosis (pentothal sodium, sodium amytal, or ether). In the Pacific Theater, particularly during the Okinawa campaign,

hypnosis induced without preliminary narcosis was considered the method of choice.[8 9]

The most commonly used technic in the Mediterranean and European Theaters employed preliminary injection of pentothal sodium. It was popularized by Grinker and Spiegel [10] as a result of their experiences in the Tunisian campaign, but had been extensively used and described before by others.[11] The technic varied somewhat from examiner to examiner. That which will be described here was developed and standardized in the Fifth and Seventh Army Psychiatric Centers.[12]

Whenever possible, a special tent or room was set up for the purpose. It was kept partially darkened and quiet during the treatment. Before treatment was begun, it was explained to the patient, and he was encouraged to expect improvement of his symptoms as the result of it. He was led to expect that in the course of the treatment he would imagine himself to be on the battlefield again, and that he would relive the forgotten experiences.

One-half gram of pentothal sodium, dissolved in 10 cc. of distilled water, was injected over the course of 4 or 5 minutes while the patient counted backwards from 100. Injection was terminated when counting became thoroughly confused or stopped. Recognizing the proper endpoint was a matter of experience. In general, between 0.15 and 0.4 gm. was injected. At the end of injection, the therapist strongly suggested that the patient was back on the battlefield at that point in time which the history had shown to represent the probable beginning of the amnesic episode. It was usually of value at the same time to simulate battlefield noises, such as the whistling of a shell, and to call out to the patient to take cover. At the 312th Station Hospital in France, special noisemaking apparatus was used for this purpose, but at most other installations such apparatus was considered neither necessary nor desirable.

In most cases, the patient now began to cower, exhibit startle reactions, and show other evidences of battlefield terror. He called out to others as if in combat and proceeded to re-enact the traumatic experiences. At the points of greatest trauma, the emotions of fear, rage, and grief were usually forcibly expressed, and tears appeared.

[8] MARKEY, O. B.: Report on psychiatric service during Okinawa campaign. Submitted to Surgeon, Tenth Army. 1 July 1945.

[9] KAUFMAN, M. R.: Report of neuropsychiatric observer in Okinawa operation Submitted to the Surgeon, Pacific Ocean Area. 16 May 1945.

[10] GRINKER, R. R., and SPIEGEL, J. P.: War Neuroses in North Africa. The Josiah Macy, Jr. Foundation, New York, N. Y., 1943.

[11] WILDE, J. F.: Narco-analysis in treatment of war neuroses. Brit. M. J. 2: 4–7, July 4, 1942.

[12] This technic was portrayed graphically in a sound movie. U. S. Army Film FB 184; Psychiatric Procedures in the Combat Area.

Ordinarily it was expedient for the therapist to remain passive at this point, allowing the patient to proceed serially through his battle experiences, without being hurried or prompted. During the reenactment it was occasionally wise for the therapist to assume the conversational role of one of the patient's "buddies," or his sergeant, lieutenant, or battalion surgeon, or of several of these successively. It was necessary to be certain that the entire series of repressed traumatic events was covered systematically before the session was terminated. If, after the patient had been allowed to produce spontaneously for some time, amnesic gaps still remained, the therapist prompted their filling by the appropriate questions and stimuli. In order that the interview not be prematurely terminated after the narcotic effects of pentothal had worn off, the therapist occasionally introduced hypnotic suggestions and commands. By doing this, he was able to prolong the interview indefinitely at his discretion.

When all amnesic material had been recaptured, the patient was prepared for termination of the procedure by being told he was in a hospital, that he had remembered the forgotten events, and that he would recall them on awakening. He was assured that his symptoms would be improved. If his disposition to noncombat duty had been already determined, he was reassured regarding this. The patient was then awakened. Reassurance was repeated, and the recaptured amnestic material was reviewed. Although many patients resisted this repetition, it was found to be extremely important. If not gone through with, the material was frequently repressed again, insight lost, and symptomatology resumed partially or completely. The disappearance of such symptoms as tics and pareses was pointed out to the patient, and he was assured that they had disappeared permanently.

If all points were systematically covered in the original session, optimal results were usually obtained in one pentothal session, and no further sessions were required. In a small percent of patients, recapture of repressed material was not complete, or there were residual symptoms, and one or two further sessions were necessary. Relief of symptoms was usually striking. Not only were hysterical symptoms such as tics and pareses removed, but probably the most striking result was seen in relief of tension, anxiety, and retardation, and in restoration of self-confidence. After a successful session, the patient gave the impression of being a healthy rather than a sick person.

Certain other types of response were less frequently encountered:

(1) In the most common variant, the patient's productions were entirely in the past tense. Often, but not always, this was accom-

panied by considerable emotion, and by appropriate gestures such as the avoidance of shells. A fair portion of such interviews were successful in recovering the amnesic material, and the therapeutic results were often satisfactory. If they were not, a second session on a subsequent day often produced a more successful dramatic reenactment, in the present tense.

(2) In another variant response, the entire session differed little from any other psychiatric interview. Little emotion was aroused, the story was recited in the past tense, and the amnesic material was usually not recovered. The patient addressed the physician as such during the interview, the typical subsequent amnesia for the session was lacking, and the therapeutic result was usually unsatisfactory.

(3) Occasionally all that was elicited was a silly, drunken response. Being of no therapeutic value, such sessions were rapidly terminated.

(4) The malingerer typically responded with negativism, refusing to cooperate, answer questions, or tell his story. Occasionally, he became echolalic. Fantastic responses and obvious volitional productions for the purpose of misleading the therapist were occasionally seen.

Uncovering therapy using pentothal was indicated in any battle-precipitated psychiatric disorder in which a period of amnesia existed for presumably traumatic battlefield events. It was indicated in nearly all battle-precipitated hysterias, with or without complete binding of anxiety. Results were almost certain to be satisfactory in patients with paralyses, pareses, tics, gross tremors, and hemi-tremors.

In many extremely tense, retarded patients with anxiety states, a period of amnesia for battlefield events could be demonstrated, and in these the procedure was definitely indicated. Perhaps some of the most gratifying therapeutic results were obtained in these patients. The procedure was of little value when amnesic gaps were not present. When, however, instead of a definite amnesic gap, there was hazy or fragmentary recollection of a certain period on the battlefield, the therapeutic results were often quite satisfactory. Intravenous injection of pentothal was often of value in patients with an entirely mute panic state. In such patients, no narcoanalysis was performed; no attempt was made to recover amnestic material or precipitate a reenactment. Instead, as the pentothal induced relaxation, ordinary conversational contact was established with the patient. This was usually successful in eliminating mutism.

Pentothal uncovering therapy was contraindicated in the severe anxiety states with panic and confusion (the pseudopsychotics). Such patients were "stuck" in their traumatic battlefield experiences,

and were in fact reenacting fragments of those experiences. With these patients, the first task of therapy was to re-establish contact and orientation. This was hindered by the administration of any sedative. In simple anxiety states of from mild to moderate degree pentothal interviews were not only unilluminating, but actually decreased tolerance to further battle stress.

(*b*) *Uncovering therapy using hypnosis.*—Uncovering technics in which the suggestible state was induced by hypnosis rather than by intravenous sedatives, were primarily used in the Pacific, particularly in the Okinawa campaign. Subsequent to induction of the dissociated state, the procedure differed little from that described for the pentothal interview.

(*c*) *Critique of manipulative uncovering methods.*—Existing explanations of the mechanisms of narcoanalysis did not fully satisfy many combat psychiatrists. There was little doubt that recovery and reintegration into consciousness of repressed traumatic memories, and the abreaction attendant thereon, were of fundamental importance, but the influence of several other factors remained unevaluated—the influence of suggestion, and the impact of this dramatic procedure on the patient-physician relationship. The role of the intravenous sedative was not clearly defined. Much fundamental research was suggested by these questions, but was never undertaken.

6. *Reassurance.*—Because psychiatric patients in the combat area were easily convinced that they were seriously ill, either physically or psychiatrically, it was found to be extremely important that the physician reassure them decisively after proper physical examination, that they had no serious physical illness. Similarly, it was found to be important that the patient be reassured concerning the magnitude of his psychiatric disability. In appropriate cases it was stressed that the reaction was situational, that it would be short-lived, and that it had no relationship to insanity. The patient was told that there should be no permanent aftereffects, and that the reaction should have no effect on civilian adjustment, on ability to work effectively, or to make proper social and marital adjustments. In patients returning to full combat duty, it was found to be wise to reassure the patient that an episode of emotional decompensation was not necessarily incapacitating for further effective combat duty. In general, events and reactions were placed in their proper realistic proportions. Effective reassurance confined itself to presentation of facts, and avoided empty expressions of confidence.

7. *Explanation.*—Patients frequently derived great benefit from explanation of the cause of their symptoms. They were greatly aided by an understanding of what may be termed the normal battle reaction,

i. e., the normal psychologic and somatic symptom complex resulting from battle fear. In appropriate cases the therapist could demonstrate that the patient's symptoms did not deviate in any important respect from this normal reaction.

8. *Manipulation of secondary gain.*—It became quite apparent to combat psychiatrists in the course of the war that the secondary gain to a person with neurotic illness was important in causing and perpetuating psychiatric disabilities in the troops. Illness could remove a man from the danger of battle and place him in the safety and comfort of a medical department installation. It could eventually result in his permanent removal from combat, or even in his return to the United States and discharge from the Army. Illness paid off, while health resulted in continued exposure to danger and deprivation.

Psychiatrists came to recognize the importance of this factor of secondary gain, and undertook to neutralize it if possible, as part of the therapy. Thus as soon as it had been determined that a given patient would not be returned to combat duty, the patient was informed of the decision. He was given reason to believe that this disposition was firm and not subject to reversal. This achieved removal of tension and pressure which resulted from anticipation of possible return to combat and eliminated further unconscious striving for the secondary gain of the illness.

Occasionally, symptoms were greatly ameliorated following a firm disposition to full combat duty. Such symptomatic improvement appeared to result from the fact that, in the face of an irrevocable disposition to full combat duty, symptoms became a burden instead of providing gain. In a few cases, secondary gain was manipulated by delaying the patient's evacuation until certain specified symptoms had subsided. In these cases, it was made clear to the patient that he would be evacuated and reclassified to noncombat duty, but that this would not occur until certain symptoms had cleared. Similarly, it was sometimes worthwhile to point out to patients from noncombat organizations the possible change in status that might accrue from illness and hospitalization. Hospitalization of a noncombat soldier, appearance before medical boards, and assignment to replacement depots always entailed some slight possibility that in the course of the administrative procedures he might be assigned to combat duty. Pointing this out was frequently therapeutically valuable.

9. *Sedation.*—The sedation policy followed in Seventh and Fifth Armies in 1944–45 represented a crystallization of previous experience. All sedation prescriptions were individualized. Each patient was interviewed briefly for screening purposes on admission. Generally, patients who had been on the battlefield a few hours before

were given adequate initial sedation. Sedation, when given, had as its purpose facilitation of one night's adequate sleep; from 0.36 to 0.55 grams of sodium amytal or a corresponding dose of pentobarbital sodium was usually given. In certain patients, sedation was continued throughout the next day, using 0.2 grams of sodium amytal, four times a day, or its equivalent. Continuous heavy sedation was seldom used because in some patients it appeared to induce moderate barbiturate intoxication, releasing such phenomena as battle dreams and occasionally producing or heightening disorientation. All patients who had received adequate sedation elsewhere were given no further medication. Soldiers who had not been in combat recently were seldom sedated. Sedation was seldom administered to those who had been subjected to minimal stress. Badly confused and disoriented patients were not given sedatives, because these heightened confusion and disorientation. Intravenous sedation was seldom necessary or desirable; it occasionally was necessary in the management of psychotics. Intravenous sedatives for the special purpose of narcoanalysis have already been discussed.

Sodium amytal was the barbiturate most commonly used in oral sedation of battle-induced psychiatric disabilities. Some psychiatrists preferred pentobarbital sodium. Seldom were any other barbiturates used for this purpose. Phenobarbital was of little value.

10. *Measures designed to restore orientation.*—In the severe anxiety states with panic and confusion (the "pseudopsychotics") the primary task of therapy was to restore the patient to proper orientation and contact. These patients were disoriented. They still considered themselves to be on the battlefield. They called out, cowered, and expressed fear and rage appropriate to the combat situation. Psychiatrists in Fifth and Seventh Armies found that sedation of such patients deepened their disorientation. Consequently, such medication, either by oral or intravenous route, was avoided. Instead, special nursing service by one of the enlisted orderlies was instituted for such patients. In addition to controlling the patient and providing necessary bed care, the chief task of the special orderly was to engage the patient in conversation and attempt to restore contact.

11. *Work therapy* played an important role in the rehabilitation of patients with battle-induced psychiatric disorders. One of the greatest needs of such patients was useful work. Formal occupational therapy of the arts and crafts type was avoided. As far as possible, the patients were assigned to useful tasks. They aided in the care of their ward, and assisted in general duties about the hospital. The complete recovery of these patients was greatly accelerated by discharging them as rapidly as possible from the hospital so that they might be assigned to military jobs, where their services would be of

value to the war effort. On such jobs, treated as normal persons, and expected to perform a normal day's work, the majority improved rapidly.

12. *Manipulation of environment.*—The Army environment is difficult to manipulate for therapeutic purposes. Occasionally, however, division and army psychiatrists were able by visiting or writing the patients' organization, to alter constructively the work arrangements of the patients, or the attitudes of others in the organization toward them, but in general, the environment of any soldier could be manipulated only by reassigning him to another military unit. In forward area psychiatry, this usually meant relieving the patient from further combat duty.

13. *Manipulation of group mechanisms.*—It was found to be of primary therapeutic importance to avoid breaking the patient's identification with his combat group. To this end, hospitalization was maintained within the division or in close proximity to it. Emphasis was placed on impending return to combat duty. Maintenance of identification with the combat group was facilitated by keeping the length of hospitalization short, by the attitudes of the psychiatrists, and by various orientation and educational measures. Army psychiatric centers carried on an active program of so-called "orientation and education" designed to promote continued interest in the war, motivation to fight, and identification with the interests of the combat group.

In general, no formal group therapy was undertaken in forward area psychiatry in the European Theater, although it was employed to some extent in the Okinawa campaign in forward area psychiatric hospitals. On the other hand, the support afforded to soldiers by the rest of the ward group was appreciated as important. Ward discipline and the demands of the ward group exerted important pressure in the direction of effective behavior. Most dramatic of such responses to group pressure was that seen in officers. At first, in the Fifth Army Neuropsychiatric Treatment Station, officers were housed on a special ward, where their tendency was to "let themselves go." When, subsequently, policy was altered and they were placed as individuals on regular wards among the enlisted men, their composure was greatly improved, and therapeutic results were much more satisfactory.

## RESULTS OF FORWARD AREA PSYCHIATRIC TREATMENT—EVALUATION OF STATISTICS

Efficiently functioning forward area psychiatric treatment programs salvaged and returned to full combat duty a large percentage of the patients admitted. In Seventh Army from 15 August to 31 December

1944, 39 percent of the patients admitted to divisional psychiatric facilities were returned to combat duty. In the same period, 24 percent of the patients admitted to army psychiatric facilities were returned to full duty. The consolidated figure for both divisional and army facilities was 46 percent. During the period 1 January to 24 May 1945 the corresponding figures were: divisions, 53 percent; army, 43 percent; and consolidated return to duty rate, 63 percent.[13] During the action of the Tenth Army on Okinawa, 83.6 percent of all hospitalized psychiatric patients were returned to full duty during the "first phase" (through 7 May 1945); during the "second phase" (8 to 28 May 1945), 57.2 percent were returned to duty; and in the "third phase" (subsequent to 28 May 1945), 38.3 percent of the patients were returned to duty.[14] In the First Army, over its entire period of combat experience (June 1944 to May 1945), division and army psychiatric facilities returned 51 percent of all patients to full combat duty.[15]

None of these figures take into account those psychiatric patients who were returned to full duty from battalion aid stations. It has been estimated that at least 60 percent of all psychiatric patients were sent to full duty from this treatment level. Statistics regarding the percentage of neuropsychiatric patients returned to full combat duty from a given echelon or treatment station reflected not merely the quality of psychiatric treatment at that point, but also many other factors. For instance, if psychiatric screening and treatment were excellent in echelons forward of the given psychiatric treatment installation, the latter would receive a large proportion of cases fit only for further evacuation. Consequently, its return to duty rate would be low. Similarly, if the divisions supported by a given psychiatric treatment installation were old veteran organizations, a high percentage of patients reaching the installation would be "burned-out" veterans who could not be returned to combat. Under such circumstances, the return to duty rate would be lower than when the divisions supported were new, fresh divisions.

## FOLLOW-UP STUDIES

The efficacy of forward area treatment methods, as measured by subsequent performance of patients on duty assignments, was studied

[13] LUDWIG, A. O.: Final summary and critique of Seventh Army Psychiatric Service for Historical Report. Submitted to Surgeon, Seventh Army. 7 July 1945.

[14] MARKEY, O. B.: Report on psychiatric service during Okinawa campaign. Submitted to Surgeon, Tenth Army. 1 July 1945.

[15] SRODES, W. G.: Neuropsychiatric service of First United States Army in European campaign—1944 and 1945. Submitted to Office of Surgeon General, U. S. Army.

by Glass [16] and by Ludwig and Ranson.[17] The former showed that 48 percent of patients returned to full combat duty had performed effectively after such return to duty. The figures of Ludwig and Ranson were in essential agreement with this. Ludwig and Ranson also found that of the patients evacuated from army psychiatric treatment facilities to the base, and subsequently reassigned within the theater to noncombat jobs, 93 percent had performed satisfactorily or better. At the time of this follow-up (from 6 to 8 months after evacuation from Seventh Army), 86.6 percent of the evacuated patients had been assigned to duty in the theater in noncombat assignments. Only 4.2 percent had been rehospitalized before reaching a new assignment, and only 9.2 percent had been evacuated to the United States as patients.

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[16] GLASS, A. H.: Quoted in Appendix I, Statistical Studies. Bull. U. S. Army M. Dept. (Supp.) pp. 200–202, Nov. 1949.

[17] LUDWIG, A. O., and RANSON, S. W.: Statistical follow-up of effectiveness of treatment of combat-induced psychiatric casualties: I. returns to full combat duty; II. evacuations to base. Mil. Surgeon 100: 51–62, Jan. 1947; 169–175, Feb. 1947.

# Insulin Resistance

## The Mechanisms Involved and the Influence of Infection and Refrigeration

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THE human body's resistance to insulin presents one of the most peculiar and least understood phenomena in clinical medicine. The condition is not restricted to persons with diabetes because resistance to insulin in excess of 1,000 units has been encountered in a number of instances in nondiabetic schizophrenic patients undergoing insulin shock therapy. Falta described the first case in 1924. To date about 65 authentic cases have been reported; Martin et al.[3] collected 27 diabetic cases from the literature up to 1940 and Smelo[4] collected 25 from 1940 to 1948.

This curious clinical entity is a transitory affair for which no actual cause can be ascribed. It occurs equally as often in males and females and has been noted in ages ranging from 2 to 72 years. The onset varies from a few days to 2 or 3 months. Infection plays an important part in the onset of many cases. The case reported here is unique in that the patient was under close hospital supervision at the moment of onset of insulin resistance, so that we have accurate daily records of his insulin requirement, as it increased. Insulin resistance may occur in diabetes at any time during the disease. Once insulin resistance occurs its duration and course are unpredictable: In about one-third of the cases the condition continues for about 3 years. Clay and Lawrence[5] reported one instance in which the condition lasted only 5 days, while Smelo reported one person

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[3] MARTIN, W. P.; MARTIN, H. E.; LYSTER, R. W.; and STROUSE, S.: Insulin resistance; critical survey of literature with report of case. J. Clin. Endocrinol. 1: 387–398, May 1941.

[4] SMELO, L. S.: Insulin resistance. Proc. Am. Diabetes A. 8: 77, 1948.

[5] CLAY, R. D., and LAWRENCE, R. D.: Insulin-resistant diabetic. Brit. M. J. 1: 697–698, Apr. 6, 1935.

with diabetes who was still highly resistant after more than 5 years. In this particular patient, 3,000 to 5,000 units of insulin daily were required over extensive periods to achieve a reasonably good degree of diabetic control.

The term insulin resistance is applied when more than 300 units of insulin daily is required for the control of diabetes. Although we have no exact information as to the amount of insulin secreted by normal man, the best estimate places the amount at about 200 units a day. The literature contains reports of totally depancreatized persons [6] (usually for malignancy) in whom the postoperative insulin requirements ranged from 40 to 100 units. It is hardly tenable that a normal man produces only 40 units a day. The explanation of complete control of totally depancreatized persons with such minor amounts of insulin can be found in the examination of the case records, viz. a small amount of food was ingested and a profound state of cachexia existed. The more profound the cachexia, with its concomitant factors of undernutrition, malabsorption, malassimilation, and greatly reduced basal state, the more hypersensitive is the individual to even trivial amounts of insulin, as shown by Allen.[7] Since the normal person produces only a few hundred units a day, the hyporesponsive state cannot be predicated solely on a basis of quantitative insulin production or requirement. The most probable conception is that these persons produce some unknown substance, an antihormone or some insulin-neutralizing or insulin-destroying substance, and that this unknown substance, which is not normally present, is able to destroy relatively large amounts of exogenous insulin which normally are far beyond the ability of the human organism to produce.

No patient may be said to be wholly nonresponsive to insulin. Some patients with diabetes have died in coma; however, they probably would have been revived if larger amounts of insulin had been employed. There are several instances of recovery from diabetic coma with doses of 5,000 units a day. In one instance of recovery 19,000 units were employed.[8] It is believed that if treated heroically with enormous doses of insulin, all patients in coma probably would be revived. The rate at which insulin is destroyed in the body is in direct proportion to the size of the dose.[9] Although insulin resistance

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[6] RICKETTS, H. T.; BRUNSCHWIG, A.; and KNOWLTON, K.: Effects of total pancreatectomy in patient with diabetes. Am. J. Med. 1: 229–245, Sept. 1946.

[7] ALLEN, F. M.: Treatment of diabetes with insulin. J. A. M. A. 81: 1330–1335, Oct. 20, 1923.

[8] BOULIN, R.; UHRY, P.; PIETTE, M.; and CHAUDERLOT: Sur un cas de coma diabétique avec insulino-résistance réduite par l'administration intraveineuse de 19,100 unités d'insuline. Bull. et mém. Soc. méd d. hôp. de Paris 63: 598–601, 1947.

[9] GREELEY, P. O.: Duration of insulin action. Am. J. Physiol. 129: 17–21, Apr. 1940.

is not specifically confined to diabetes, nevertheless in nonresponsive patients diabetes obeys the same laws and principles as in ordinary diabetes. If insulin is omitted the patients go into coma; if excessive doses of insulin are employed, mild or severe reactions may occur; insulin requirement increases with intercurrent infections and also fluctuates with alterations in body weight just as in usual diabetes. The doses cited above are extreme instances. Some insulin-insensitive patients, reported in the literature, have required not more than from 500 to 900 units for good control, over periods of many months. Once insulin resistance is established there is an increasing demand up to a certain maximum point; a plateaulike level is finally reached and, after weeks or months, this is followed by a gradual reduction in insulin demand. Frequently, as in the case presented here, infection plays a very important role; in our patient an infectious process associated with a gangrenous extremity on two separate occasions called for an unusual increase in insulin demand.

This unusual refractiveness to insulin is characteristic of only a few other hormones except perhaps the parathyroid. Lisser and Shepardson [10] encountered unusual resistance to parathyroid extract in a patient with parathyroid tetany. Clinicians frequently encounter patients who, for some unexplainable reason, are not affected adversely by large (0.6 or 1.0 gram) doses of desiccated thyroid extract. Ability to tolerate larger doses without evidences of therapeutic hyperthyroidism is not recorded, except in a few rare instances in which failure of absorption from the intestinal tract is evident. To assume that a person is resistant or hyporesponsive to the thyroid hormone would mean that he required or could tolerate as much as from 200 to 300 grains of thyroid extract in 24 hours in order to control clinical manifestation of myxedema. No such peculiarly resistant situation has been reported to date. There are a few reports of resistance to estrogenic substances or to desoxycorticosterone acetate.

Insulin resistance is not to be confused with certain states associated with temporary increases of insulin requirement. In diabetic acidosis there is a temporary increase in insulin demand. Uncontrolled diabetes, improperly balanced diets, high-fat diets, high-carbohydrate diets, and high-calorie diets require relatively large doses of insulin, but these are explainable. There is a temporary increase in insulin requirement in the presence of infections; the requirement increases as the infection increases, but this rarely exceeds a few hundred units over a brief period of time and subsides quickly as the infection dimin-

[10] LISSER, H., and SHEPARDSON, H. C.: Further and final report on case of tetania parathyreopriva, treated for year with parathyroid extract (collip), with eventual death and autopsy. Endocrinology 13: 427–454, Sept.–Oct. 1929.

ishes. Karelitz et al.[11] have shown that the red blood cells of the normal person during infections, when mixed with insulin inhibit the action of insulin and also have a much greater power of destroying or inhibiting insulin action. Pus cells even in patients with diabetes have a remarkable property of neutralizing or destroying insulin activity. Leukemic cells also destroy insulin at an abnormally high rate. Hemochromatosis[12] and particularly hepatic disease notoriously call for high insulin administration. Patients with acromegaly, Cushing's syndrome, hemorrhagic cysts of the midbrain, and hyperthyroidism are known to be resistant to insulin, but in a very minor degree compared to the present clinical entity under consideration.

Death in insulin-resistant patients is not directly related to the diabetes by any means; in fact, most of the deaths result from nondiabetic conditions. Out of 26 deaths,[4] 19 were caused by such nondiabetic conditions as tuberculosis, heart disease, hemochromatosis, hepatic infarcts, and, in one instance, no abnormalities could be found at autopsy. Five deaths were specifically related to diabetes, i. e. diabetic coma. In all probability coma in these five instances could have been prevented; 2,000 units or less were used daily, whereas there are a number of instances of relief from coma when from 5,000 to 19,000 units were used. It may be stated, therefore, that insulin-resistant patients should not necessarily die of diabetes. Wayburn[13] in 1935 reported a patient with active pulmonary tuberculosis and diabetes and supposed total resistance to insulin; the patient died in diabetic coma. In view of more recent experience the patient could not be considered totally refractory to insulin because only a few thousand units of insulin were used and larger amounts are known to be effective.

The following is a summary of the history and progress of a patient with obstinate insulin resistance associated with infection.

## CASE REPORT

The patient, a 58-year-old white man, had had diabetes since 1943. During the first year his diabetes was fairly well controlled solely by diet. In 1945 he noted failing vision and the oculist reported bilateral cataracts. In January 1946 the left cataract was removed. By March 1948 he was unable to control the diabetes and he entered the United States Naval Hospital, San Diego, Calif.

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[11] KARELITZ, S.; COHEN, P.; and LEADER, S. D.: Insulin inactivation by human blood cells and plasma in vitro; effect of normal and of diabetic blood on insulin action. Arch. Int. Med. 45: 546–558, Apr. 1930.

[12] ALLAN, F. N., and CONSTAM, G. R.: Insulin resistance in case of bronze diabetes. M. Clin. North America 12: 1677–1687, May 1929.

[13] WAYBURN, E.: Complete insulin resistance in diabetes. Am. J. M. Sc. 190: 157–164, Aug. 1935.

Physical examination was not remarkable except for the presence of generalized arteriosclerosis, decreased peripheral circulation, and cataract of the right eye. Further eye examination revealed hemorrhages and exudates with advanced arteriosclerotic changes in both fundi. With a diet of 1,380 calories and 20 units of protamine zinc insulin and 10 units of regular insulin, the diabetes was easily controlled. On 30 March 1948, the right cataract was removed.

The patient was retained in the hospital for domiciliary care because of his senility, mental incapacity, and blindness. In March 1948 the diabetes became progressively more difficult to control. His mental status prevented his cooperation and he became adept at obtaining food surreptitiously. In October 1948 he was given a 1,200 calorie diet under strict supervision. Reasonably good control was obtained with 60 units of protamine zinc insulin and 60 units of regular insulin. In November 1948 he developed a trophic ulcer of the left great toe. Penicillin therapy was instituted. Nevertheless, a large ecchymotic area appeared on the anterior aspect of the ankle with lymphangitis extending to the knee. His diabetes very quickly became uncontrollable and the insulin requirements increased rapidly to 1,600 units a day. The patient was prepared for amputation of the infected left leg. The leg was refrigerated for 24 hours preceding surgery. The drop in insulin requirement during refrigeration was quite extraordinary; whereas he had been receiving from 900 to 1,600 units daily, there was a rapid fall to less than 100 units during the period of refrigeration.

Following amputation, he was still highly resistant to insulin. His daily requirement was 300 units, but during the following year 400 or 500 units were often required.

In October 1949 he developed an infection of the nail of the right great toe. Pulsations in the popliteal, posterior tibial, and dorsalis pedis arteries were absent. Within a period of 3 days, the third and fourth toes became cyanotic and painful. Sympathetic lumbar blocks were employed without benefit. Within 10 days, his insulin requirement rose to 700 units. On 20 October 1949, the leg was refrigerated and a midthigh amputation was performed on 21 October. Just as in the preceding amputation, there was a remarkable fall in the insulin requirement to less than 100 units during the process of refrigeration.

At the present time, after almost 2 years, the patient is still insulin resistant. He is now very well controlled with from 150 to 200 units of insulin daily.

## MECHANISMS INVOLVED IN INSULIN RESISTANCE

Very little is known concerning the factors which bring about resistance to insulin, both in patients with diabetes and in normal per-

sons. There is no relationship between the duration of diabetes, the severity of the disease, the type of insulin, or the previous state of diabetic control. We know very little about the action of insulin although it his been in use for almost 30 years.

*Biochemical function of insulin.*—It has been long recognized that glucose utilization and oxidation are not entirely dependent on the action of insulin. The part played by the hormone in these physiologic actions is still in doubt. The importance of insulin in making possible carbohydrate storage in the form of glycogen and fat was first stressed by Drury [14] and Pauls and Drury.[15] This work has been amply confirmed by isotope tracer studies.[16] Beyond the fact of carbohydrate storage, principally as fat, there is little agreement concerning the over-all action of insulin. The biochemical details of this storage function are not known. Probably the first step in the utilization of glucose for any purpose is the formation of glucose-6-phosphate under the influence of the enzyme hexokinase. The recent articles by Cori and his coworkers [17 18] suggested that the action of insulin was hexokinase action, if not actively, by removing the inhibition of the anterior pituitary or adrenal cortex hormones. However, Stadie and Haugaard,[19] Mirsky and Broh-Kahn,[20] and others have failed to show any alteration of the hexokinase reaction in muscle or kidney extracts from diabetic rats when compared with normal controls. It is very probable that insulin is concerned with the early phase of glucose oxidation. The normal blood pyruvate response obtained on administration of glucose is absent in the depancreatized dog or patient with diabetes unless insulin is given simultaneously.[21 22] Recent work from this laboratory involving the administration of radioactive carbon-labeled glucose with and without insulin, to eviscerated rabbits, indicates that insulin accelerates the formation of a

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[14] DRURY, D. R.: Role of insulin in carbohydrate metabolism. Am. J. Physiol. 131: 536–543, Dec. 1940.

[15] PAULS, F., and DRURY, D. R.: Influence of insulin upon glycogen storage in diabetic rat. J. Biol. Chem. 145: 481–485, Oct. 1942.

[16] STETTEN, DEW., JR., and BOXER, G. E.: Studies in carbohydrate metabolism; metabolic defects in alloxan diabetes. J. Biol. Chem. 156: 271–278, Nov. 1944.

[17] COLOWICK, S. P.; CORI, G. T.; and SLEIN, M. W.: Effect of adrenal cortex and anterior pituitary extracts and insulin on hexokinase reaction. J. Biol. Chem. 168: 583–596, May 1947.

[18] PRICE, W. H.; CORI, C. F.; and COLOWICK, S. P.: Effect of anterior pituitary extract and of insulin on hexokinase reaction. J. Biol. Chem. 160: 633–634, Oct. 1945.

[19] STADIE, W. C., and HAUGAARD, N.: Hexokinase reaction in tissue extracts from normal and diabetic rats. J. Biol. Chem. 177: 311–324, Jan. 1949.

[20] MIRSKY, I. A., and BROH-KAHN, R. H.: Hexokinase activity and diabetes mellitus. Science 106: 148–149, Aug. 15, 1947.

[21] BUEDING, E.; FAZEKAS, J. F.; HERRLICH, H.; and HIMWICH, H. E.: Effect of insulin on pyruvic acid formation in depancreatized dogs. J. Biol. Chem. 148: 97–104, Apr. 1943.

[22] BUEDING, E.; WORTIS, H.: FEIN, H. D.; and ESTURONNE, D.: Pyruvic acid metabolism in diabetes mellitus. Am. J. M. Sc. 204: 838–845, Dec. 1942.

water-soluble metabolite. Further work is being carried out on these studies.

*Absorption of insulin.*—A consideration of the failure of absorption of insulin from the site of injection is important; however, we have no data that lead us to believe that absorption of insulin in the hyporesponsive patient is any different from that in the usual patient with diabetes. Insulin is administered in a watery solution and readily permeates all tissues. Insulin-resistant persons are equally resistant to large amounts of intravenously administered or subcutaneously injected insulin. Root et al.[23] in 1944 showed that there was a minor delay in absorption of radioactive insulin in resistant individuals as compared with controls, but there was nothing to suggest failure in total quantitative absorption. Furthermore, we now question the chemical composition of the material used and assumed to be radioactive insulin.

*Excessive loss of insulin in the urine.*—In the early years following the discovery of insulin one of the explanations for insulin resistance pertained to undue loss of insulin through the urine. With improvements in insulin assay methods and more complete study, we now know that the amount of insulin lost in the urine is negligible in normal, diabetic, and hyporesponsive patients. Very little is known about the excretion of the end products of insulin in the urine, if any. Mirsky et al.[24] demonstrated that the average daily excretion of urinary insulin was only 0.04 units per day in normal persons and 0.03 units in diabetic persons; also that mere minute fractions of very large amounts of injected insulin were excreted by either subject. Insulin-resistant patients ordinarily excrete no more insulin than normal persons and when injected with very large amounts of exogenous insulin show no increase in urinary output. This leads to the assumption that insulin is destroyed in the human body.

*Allergy.*—Local sensitivity to insulin in such forms as wheals, urticaria, painful nodules at the site of injection, or lipodystrophy[25] is not to be confused with hyporesponsiveness or insulin resistance. However, about 10 percent of the insulin-resistant patients did exhibit local allergic manifestations to insulin. The use of highly purified forms of insulin and recrystallized insulin in several instances has not brought about a decrease in demand for insulin or served to make

[23] ROOT, H. F., and others: Absorption of insulin labelled with radioactive iodine in human diabetes. J. A. M. A. 124: 84–90, Jan. 8, 1944.

[24] MIRSKY, I. A., ET AL.: Urinary excretion of insulin by normal and diabetic subjects. J. Clin. Investigation 27: 515–519, July 1948.

[25] OESTREICHER, D. L., and WATSON, E. M.: Insulin fat atrophy. Am. J. M. Sc. 218: 172–178, Aug. 1949.

patients any less resistant. There are many references in the literature citing the coexistence of local skin reaction and temporary increases in insulin requirement in which it is concluded that the patients were allergic to insulin. Full supporting evidence, however, is not sufficient to be convincing. Allan and Scherer [26] in 1933 presented the findings of a 55-year-old woman with diabetes who showed urticaria and wheals, whose insulin requirement was moderately excessive. It was assumed that the resistance was of an allergic character. She had many complications—acidosis, Hodgkin sarcoma, and coronary heart disease, which today would be considered as factors in increasing the insulin requirement rather than to assume that some allergic factor was responsible.

In all probability, local sensitivity and allergic reactions result from impurities in commercial insulin. Because insulin is a protein it might easily be contaminated with other proteins or split products of questionable nature. Too little attention has been paid to the actual purity of insulin, and in some important articles on the immunization of animals against insulin the question of the purity of the insulin used as an antigen has been overlooked. Recently Jorpes [27] has shown that allergic reactions were universally eradicated by the use of insulin that had been purified by recrystallization. Three hundred diabetic patients who showed localized or generalized reactions became symptom-free when insulin which had been recrystallized from three to five times was substituted for the ordinary commercial product.

*Immunity to insulin.*—In 1938 Banting et al.[28] published a report of a nondiabetic schizophrenic patient who built up a remarkable increase in tolerance to insulin exceeding 1,000 units during the course of insulin shock therapy. The initial treatment with 20 units of regular insulin reduced the blood sugar level to 0.080 mg. per 100 cc. whereas after 59 treatments there was very little reduction in the blood sugar level with 1,000 units of insulin. An immune reaction was discussed as a likely possibility.

In view of the size and complexity of the insulin molecule, some degree of antibody formation might occur. Although the molecule contains nine or more aminoacids and 3.2 percent sulfur, we cannot assume that it is antigenic. It is further illogical to consider that a substance which is present as a normal part of the organism should be physiologically antagonistic to the same organism. If it were

[26] ALLAN, F. N., and SCHERER, L. R.: Insulin resistance due to allergy, with report of case. Am. J. M. Sc. 185: 815–821, June 1933.

[27] JORPES, J. E.: Recrystallized insulin for diabetic patients with insulin allergy. Arch. Int. Med. 83: 363–371, Apr. 1949.

[28] BANTING, F. G.; FRANS, W. R.; and GAIRNS, S.: Anti-insulin activity of serum of insulin treated patient. Am. J. Psychiat. 95: 562, 1938.

capable of producing antibodies we would expect to encounter more instances of insulin resistance in more than 1 million persons with diabetes in America; we would also anticipate varying degrees of insulin resistance. That insulin is a poor antibody producer is very clearly shown by Lerman [29] who failed to produce skin hypersensitivity in rabbits or guinea pigs with repeated doses of insulin subcutaneously or intraperitoneally. The precipitation test was used as a measure. Likewise, he failed to show that the serum from insulin-treated animals offered any protection to the normal animal against minimal lethal doses of insulin. Examination of the blood from 6 insulin-resistant patients failed to show insulin antibodies or passive-transfer antibodies.

Lowell [30] presented a method for demonstrating neutralization of insulin in mice by serum obtained from 2 insulin-resistant subjects. The presence of this insulin-neutralizing activity was associated with the variations in the degree of resistance to insulin. He concluded that insulin resistance may occur on an immunologic basis and under certain circumstances the antibodies exhibited species specificity. He differentiated between the insulin-neutralizing antibodies and skin-sensitizing antibodies. This same observer [31] also reported the production of insulin resistance in rabbits following the repeated injections of a mixture of heat-killed acid-fast organisms of *Micrococcus butyricus*. The results were not very uniform or very striking so far as the antigenicity of insulin is concerned. Care is essential in evaluating results of hypersensitiveness to insulin in experimental animals, especially mice. There are great variations individually. There is also a difference in insulin tolerance for various classes of vertebrates. Birds have a relatively higher tolerance than mammals. Chase et al.[32] inbred 3 strains of white mice of the University of Chicago colony for 15 brother-sister generations and was able to produce insulin-resistant strains on the basis of heredity. Some strains were as much as 590 times as resistant as others. Once a resistant strain was produced there was no difference in age, sex, or weight.

*The inactivation of insulin in the body; effect of tissue extracts.*—Because none of the previously mentioned mechanisms—immunity, failure of absorption, allergy, excessive loss of insulin in the urine, et

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[29] LERMAN, J.: Insulin resistance; role of immunity in its production. Am. J. Sc. 207: 354–360, Mar. 1944.

[30] LOWELL, F. C.: Evidence for existence of 2 antibodies for crystalline insulin. Proc. Soc. Exper. Biol. & Med. 50: 167–172, May 1942.

[31] LOWELL, F. C., and FRANKLIN, W.: Induced insulin resistance in rabbit. J. Clin. Investigation 28: 199–206, Mar. 1949.

[32] CHASE, H. B.; GUNTHER, M. S.; MILLER, J.; and WOLFFSON, D.: High insulin tolerance in inbred strain of mice. Science 107: 297–299, Mar. 1948.

cetera—give us the faintest clue concerning the cause of insulin resistance, a final consideration must be given to the eventual fate of insulin within the organism. It is generally assumed that insulin is destroyed rapidly in the body, but the exact mechanism or site is unknown. In 1938 Lehmann and Schlossmann[33] found that cell-free extracts of muscle structures had the power to inactivate insulin; they also found that there were two different fractions in the extract, each of which could render insulin inert; one was a dialyzable factor and the other a nondialyzable factor. Proteolytic activity alone does not account for the inactivation. The agent responsible for the destruction of insulin, as far as in-vitro studies are concerned, exhibits the properties of an enzyme to which the term insulinase has been applied. Mirsky et al.[34 35] prepared extracts from various tissues and studied the variation in their insulin-inhibiting properties. Supernatant fluids from freshly homogenized body tissues were mixed with insulin and incubated; the destruction of insulin in the incubator mixtures was indicated by its failure to lower the blood sugar of rabbits when it was injected intravenously. Liver tissue was shown to be the most potent in its insulin-inhibiting ability; blood plasma was a poor inhibitor. The tissues capable of inactivating insulin in order of potency were liver, kidney, muscle, brain, whole blood, blood cells, and plasma. It was assumed that the distribution of insulinase in the various tissues was in proportion to their insulin-inhibiting qualities. The normal inhibitors of enzymatic action, zinc and copper, when added to the various tissue-insulin mixtures, were capable of inhibiting insulinase action. Just what part this enzyme system might play in insulin resistance is still a matter for consideration, but there is little doubt that tissues do contain enzymes capable of destroying insulin at a rapid rate.

## SUMMARY AND CONCLUSIONS

Insulin resistance is a rare clinical phenomenon, the mechanism of which is not understood. Infection aggravates the condition. In our patient refrigeration of the gangrenous limbs preparatory to amputation brought about a dramatic fall in requirement from almost 2,000 units to less than 100 units of insulin. Following amputation and the

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[33] LEHMANN, H., and SCHLOSSMANN, H.: The action of cell-free muscle extract of insulin. J. Physiol. 94: 15P, 1938.

[34] MIRSKY, I. A., and BROH-KAHN, R. H.: Inactivation of insulin by tissue extracts; distribution and properties of insulin inactivating extracts. Arch. Biochem. 20: 1–9, Jan. 1949.

[35] SIMKIN, B.; BROH-KAHN, R. H.; and MIRSKY, I. A.: The inactivation of insulin by tissue extracts. III. The effect of force-fed diets on insulinase activity of rat liver extracts. Arch. Biochem. 24: 422, 1949.

subsidence of the effect of refrigeration the insulin requirement promptly rose to its previous high level. Insulin resistance cannot be accounted for on the basis of loss of insulin in the urine, failure of absorption of insulin, allergy, or immune reaction. Undue destruction of insulin within the organism offers the most likely explanation.

# Carcinoma of the Prostate

JAMES C. KIMBROUGH, *Colonel, MC, U. S. A.*[1]

IN THE 10-year period ending 31 December 1949, 435 patients were operated on for benign prostatic hypertrophy in this hospital. In the same decade, 78 patients were treated for carcinoma of the prostate, a total of 513 patients with prostatic enlargement (table 1).

TABLE 1.—*Number of patients with prostatic enlargement in 10-year period*

| Year | Patients with benign hypertrophy | Patients with carcinoma | Total | Percent with carcinoma | Patients treated by perineal prostatectomy | Percent of patients with carcinoma treated by prostatectomy |
|---|---|---|---|---|---|---|
| 1940 | 42 | 10 | 52 | 19.2 | 1 | 10 |
| 1941 | 49 | 3 | 52 | 5.7 | 0 | 0 |
| 1942 | 29 | 4 | 33 | 12.7 | 0 | 0 |
| 1943 | 32 | 4 | 36 | 11.0 | 1 | 25 |
| 1944 | 26 | 4 | 30 | 13.3 | 2 | 50 |
| 1945 | 41 | 2 | 43 | 4.9 | 2 | 100 |
| 1946 | 50 | 7 | 57 | 12.3 | 3 | 42.9 |
| 1947 | 50 | 18 | 68 | 26.5 | 13 | 72.9 |
| 1948 | 59 | 14 | 73 | 19.2 | 9 | 64.3 |
| 1949 | 57 | 12 | 69 | 17.4 | 8 | 66.7 |
| Total | 435 | 78 | 513 | 15.2 | 39 | 50 |

*Treatment.*—Radical perineal prostatectomy was performed in 39 (50 percent) of the patients with carcinoma. In the remaining 50 percent the carcinomatous process had spread by local extension or by metastases beyond the limits of surgical eradication; these received only palliative treatment. Important advances have been made in the palliative treatment of carcinoma of the prostate. Although the life of the patient has been prolonged and made more comfortable, the only cure is complete surgical eradication of the cancerous process, which is possible only if the malignancy is detected before spread beyond the limits of the prostate gland has occurred.

*Diagnosis.*—Digital rectal examination is the most important procedure in early diagnosis. Pain, dysuria, and other subjective symptoms appear too late in the course of the disease for surgical cure, and

[1] Walter Reed Army Hospital, Washington, D. C.

phosphatase elevation is usually significant only after the process has extended beyond surgical limits. Other diagnostic signs (suggestive roentgenographic findings and metastases in the sternal marrow) appear too late to permit curative excision.

## DISCUSSION

Cancer of the prostate occurs as a hard nodule in the posterior lobe in more than 80 percent of the cases. This nodule is easily detected early. If the lateral lobes are first involved the nodule will be deeper and not so easily detected. The hard prostate is suggestive of carcinoma. Fixation, extension to the seminal vesicle, intervesicular space, and trigone are late phenomena and render surgical aid questionable. It does not require special urologic training to detect carcinoma of the prostate early. Late diagnoses are not the results of inadequate knowledge on the part of the physician but are caused by the failure to make the rectal examination. Carcinoma of the prostate rarely occurs before the fourth decade. Rectal examination should be a part of every physical examination and is imperative in patients over 40 years old. Early detection of cancer of the prostate should be possible in more than 80 percent of the cases if proper rectal examination is made.

The increasing incidence of early diagnosis and operation for cure will be noted by referring to table 1. In the last 3 years about 70 percent of the patients with carcinoma of the prostate admitted to this hospital were amenable to radical prostatectomy. This incidence of cure can be increased by insisting on more frequent rectal examination.

## CONCLUSIONS

Digital rectal examination in all physical examinations is the most important phase in the management of carcinoma of the prostate. All patients in whom a nodular or hard prostate gland is found should be hospitalized for diagnosis and treatment.

# Repair of Traumatic Diaphragmatic Hernia

## Report of a Case With Concomitant Splenectomy and Nephrectomy

MARVIN L. GERBER, *Commander, MC, U. S. N.*[1]

THE following case is presented because it illustrates a combination of three serious intra-abdominal injuries, each of which alone carries an appreciable mortality rate.

### CASE REPORT

A 24-year-old Navy nurse was admitted to the hospital on 6 March 1950 about 1 hour after an automobile collision. She complained of pain in the back and left chest and generalized abdominal pain.

Physical examination revealed a mentally alert young woman in moderate shock with no external evidence of trauma. Pulse rate was 140; respirations, 24; and blood pressure, 70/50. The patient was somewhat dyspneic, very pale, and cyanotic about the lips. There was dullness to percussion over the entire left side of the chest with absence of breath sounds. There was point tenderness over the left eighth, ninth, and tenth ribs posteriorly. There was generalized abdominal tenderness and rebound tenderness, with moderate muscle spasm; peristalsis was inaudible.

Emergency shock treatment was instituted immediately. The patient was given morphine, 1,000 cc. of plasma, and oxygen by mask with temporary improvement. The packed-cell volume of the blood was 37 percent. A roentgenogram of the chest (fig. 1) demonstrated a normal right hemidiaphragm with no visualization of the left diaphragm. The heart was displaced to the right and the right lung parenchyma compressed. There was essentially complete collapse of the left lung with probable rupture of the left diaphragm, permitting most of the stomach and probably the spleen to occupy the middle and lower thirds of the left chest. There were fractures through the posterior eighth, ninth, and tenth ribs on the left without significant displacement. A roentgenogram of the abdomen showed slight obscuring of the left psoas shadow.

The packed-cell volume of the blood dropped to 25 percent within 2 hours. A catherized urine specimen was grossly bloody.

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[1] U. S. Naval Hospital, Mare Island, Calif.

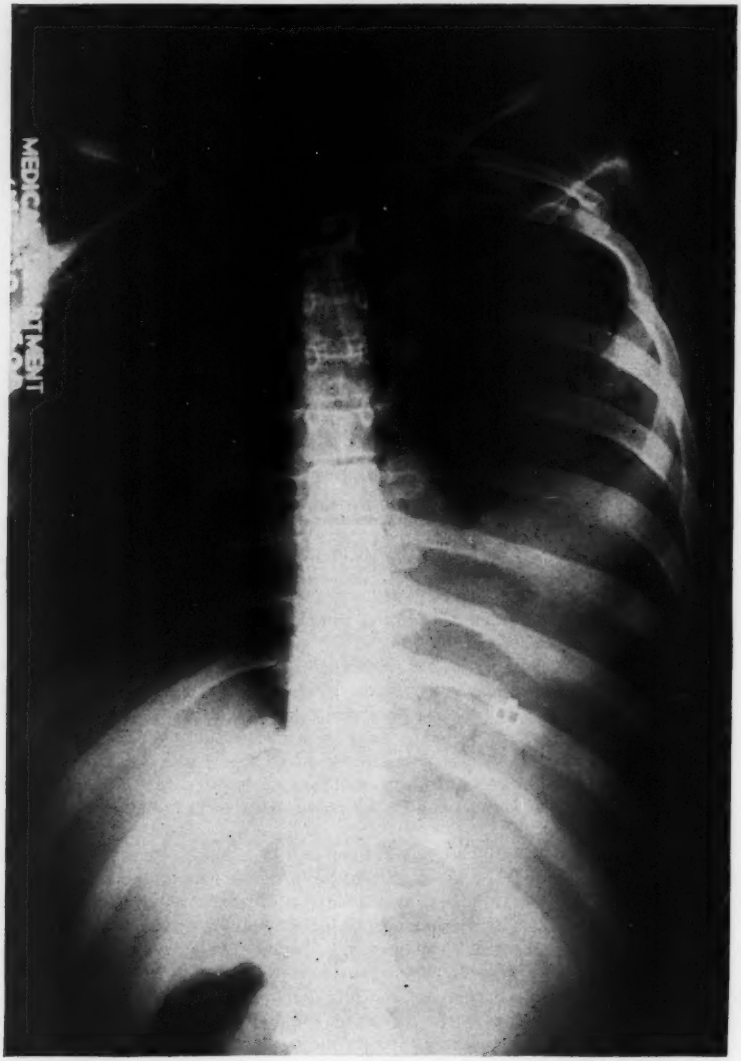

*Figure 1.—Preoperative roentgenogram.*

*Operation.*—The patient was anesthetized with pentothal sodium and curare intravenously, plus nitrous oxide and oxygen intratracheally. The blood pressure became unobtainable and blood was administered by forced pressure, using the three-way stopcock technic. The patient rallied and the abdomen was entered through a left upper rectus muscle-splitting incision. Large quantities of blood

and blood clots were evacuated from the peritoneal cavity. There was a radial tear in the left diaphragm extending from the esophageal hiatus almost to the periphery. The stomach, spleen, and left lobe of the liver were reduced from the chest and inspected. There were two small insignificant lacerations of the liver. The ruptured and bleeding spleen was removed and the vessels were ligated with silk. Blood clots and blood were evacuated from the left pleural cavity, in which the lung was completely collapsed. The diaphragm was repaired with a series of interrupted through-and-through silk sutures. Further exploration revealed a hematoma in the left kidney region. The posterior peritoneum was incised, exposing a lacerated and bleeding left kidney. The kidney was removed and the vessels and ureter were ligated with silk; the posterior peritoneum was then closed with a continuous catgut suture. The abdominal incision was closed in layers without drainage and the left phrenic nerve was exposed through a low cervical incision and crushed with a hemostat. The patient received 3,000 cc. of blood during the procedure.

*Diagnosis.*—Traumatic rupture of the diaphragm, spleen, and left kidney.

*Pathologist's report.*—The spleen measured 12 by 8 by 4 cm. and weighed 200 grams. The capsule was smooth and thin and the tissues firm. At the hilus and anterior margin there was a large, jagged, "bursting" type of laceration measuring 7 cm. through which macerated tags of splenic pulp and blood clot protruded. On section, the remainder of the splenic tissues appeared normal.

The left kidney measured 10.5 by 6 by 3 cm. and weighed 145 grams. The capsule had been stripped and the surface was smooth. A jagged linear rupture line extended through the upper pole into the hilus, almost completely separating the upper pole from the rest of the kidney. The pelvis and stump of ureter appeared normal.

*Postoperative treatment and course.*—The patient was returned to the ward in good condition and placed in an oxygen tent. Continuous gastric suction through a Levin tube was begun and the legs were wrapped with elastic bandages. Another 500 cc. of blood were administered, and the patient was given penicillin, prostigmine, fluids parenterally, vitamins, and protein hydrolysate. The pulse and blood pressure remained stable, but there was some cyanosis and dyspnea; a roentgenogram demonstrated complete collapse of the left lung. A thoracostomy was performed in the left seventh interspace and a 14F catheter was inserted and connected to a Wangensteen suction apparatus.

The patient's condition was satisfactory on the first postoperative day. The left lung was completely re-expanded and the thoracostomy tube was removed. The patient was able to take deep breathing exercises and to exercise the legs regularly; the elastic bandages were removed.

On the second postoperative day the red blood cell count, urine, blood urea nitrogen, serum protein, and chlorides were all normal. The 24-hour urinary output was 2,675 cc. and the temperature 99.6° F.

On the third postoperative day peristalsis was active and the gastric suction was discontinued. Fluids were given by mouth. The clips were removed from the neck incision. Oxygen was discontinued.

The remainder of the postoperative course was uneventful except for thoracentesis on two occasions to remove some amber fluid from the left pleural space. A chest roentgenogram (fig. 2) on 10 April 1950 was normal except for a slight elevation of the left diaphragm. On 11 April 1950 the patient left on convalescent leave, entirely asymptomatic. She returned to duty 1 month later.

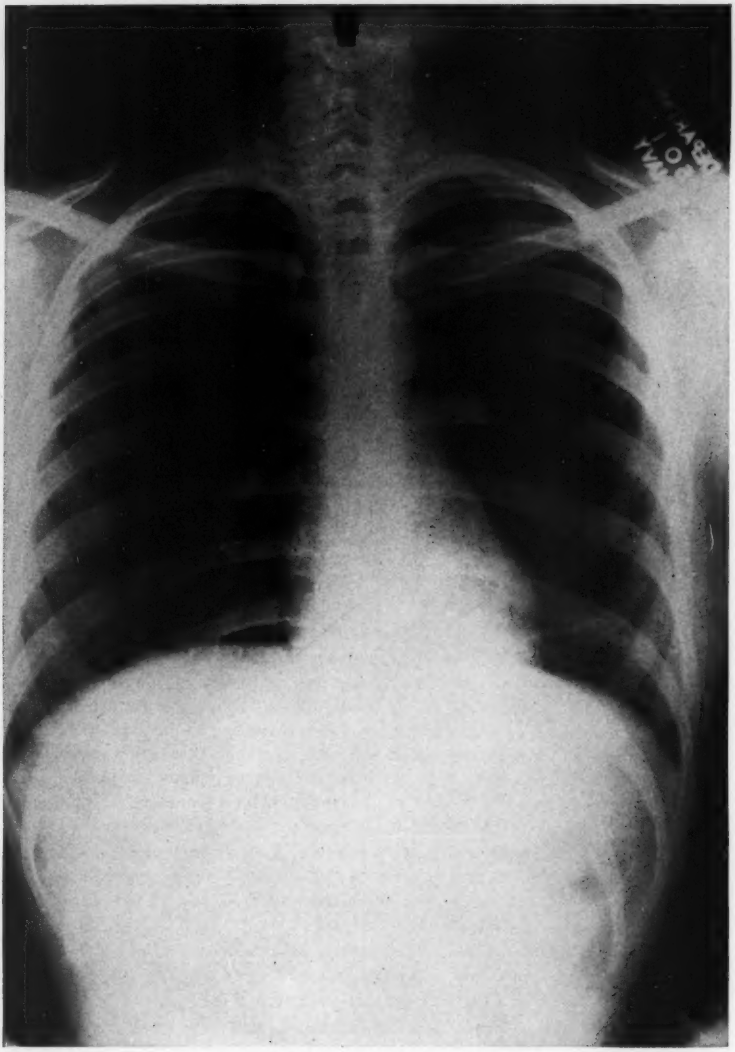

*Figure 2.—Postoperative roentgenogram.*

## COMMENT

The recovery of a patient subjected to a major operation following such severe trauma is a tribute to the recent advances in anesthesia and postoperative physiology. It is to be noted that specific measures were instituted to prevent serious postoperative complications such as

phlebothrombosis, paralytic ileus, atelectasis, pneumonia, wound disruption, and empyema.

In Harrington's[2] series of 58 patients with traumatic diaphragmatic hernia, there were 8 splenectomies, usually because of interference of an adherent spleen with the repair of the diaphragm. In his series there were no patients with concomitant nephrectomy; the mortality rate was 8.7 percent. The abdominal approach was preferred because of less risk of thoracic complications.

According to Ellison,[3] the choice between thoracic and abdominal approach is purely one of personal preference. In our patient an ideal exposure for the diaphragmatic repair, splenectomy, and nephrectomy was obtained with a left rectus incision.

Twenty-eight cases of traumatic diaphragmatic hernia in which no recurrences were observed since using a phrenic nerve crush to paralyze the left leaf of the diaphragm were reviewed by Hughes et al.[4] Although many authors advocate a two-layer repair with interrupted silk sutures, a single layer of through-and-through sutures proved to be rapid and effective in our patient.

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[2] HARRINGTON, S. W.: Various types of diaphragmatic hernia treated surgically; report of 430 cases. Surg., Gynec. & Obst. 86: 735–755, June 1948.

[3] ELLISON, E. H.: Diaphragmatic hernia; review of literature and report of two unusual cases. Am. J. Surg. 77: 152–161, Feb. 1949.

[4] HUGHES, F.; KAY, E. B.; MEADE, R. H., JR.; HUDSON, T. R.; and JOHNSON, J.: Traumatic diaphragmatic hernia. J. Thoracic Surg. 17: 99–110, Feb. 1948.

# Empyema In Infancy

JAMES A. DOUCETT, *Captain, MC, A. U. S.*[1]
JOHN T. BOWERS, *First Lieutenant, MC, A. U. S.*[1]

THE treatment of empyema in infants and children was primarily surgical prior to the advent of penicillin therapy. Numerous methods of draining the empyema cavity had been tried but uniformly poor results were obtained, particularly in infants under 2 years of age. This situation has been greatly improved, first with the advent of sulfonamide therapy in conjunction with repeated thoracentesis, and later, and more dramatically, with penicillin. The case presented here demonstrates what can be expected from early institution of adequate penicillin therapy in conjunction with repeated thoracentesis in those patients harboring a penicillin-sensitive organism.

## CASE REPORT

A 7-week-old white female infant was admitted to this hospital on 9 March 1950. Her parents reported that she had had a cold, manifested by cough, low-grade fever, and a serous nasal discharge, for about 2 weeks prior to admission. About 24 hours prior to admission, she developed respiratory distress with dyspnea and cyanosis that persisted to the time of admission.

Physical examination on admission revealed a moribund, poorly nourished and poorly developed white female infant with cyanosis and respiratory distress. The respirations were shallow and feeble and respiratory excursions were definitely limited on the left side. Tachypnea with frequent episodes of apnea were noted. There was slight inflammation of the pharynx. The tympanic membranes were normal. Examination of the chest revealed flatness to percussion over the entire left side of the chest, with absent breath sounds over the same area. The trachea was displaced to the right. The heart sounds were distant, of poor quality, and there was tachycardia. The abdomen was distended with gas but no masses or organs were palpable. The rectal temperature was 100.2° F. The patient weighed 8 pounds 6 ounces.

The leukocyte count was 13,800, with 45 percent polymorphonuclear cells, 54 percent lymphocytes, and 1 percent monocytes. The erythrocyte count was 2,910,000 with 10 grams of hemoglobin. Throat culture taken at the time of admission yielded hemolytic *Staphylococcus aureus.*

A roentgenogram of the chest (fig. 1) at the time of admission showed complete obliteration of the left pleural space by fluid, with displacement of the trachea and mediastinum to the right, consistent with the clinical diagnosis of massive empyema of the left side of the chest. Slight improvement occurred

[1] U. S. Army Hospital, Fort Hamilton, Brooklyn, N. Y.

*Figure 1.—Roentgenogram at time of admission, showing massive empyema of the left side of chest and shift of the trachea and mediastinum to the right.*

after oxygen was administered. A thoracentesis was performed; 107 cc. of yellow-green purulent material was slowly withdrawn and 75,000 units of penicillin dissolved in 3 cc. of normal saline solution was introduced into the pleural space. A stain of the material removed showed gram-positive cocci. A pure culture of hemolytic *Staph. aureus* was recovered.

On removal of the purulent fluid from the left pleural cavity, the infant's general appearance immediately improved. She became less cyanotic, the respiratory distress decreased, the trachea shifted toward the midline, and breath sounds were again audible over the left side of the chest. A postthoracentesis roentgenogram of the chest (fig. 2) showed an area of increased density in the left periphery, overlying the scapula. The infant was given 100,000 units of crystalline penicillin intramuscularly every 3 hours. On the second hospital day the left pleural space was again aspirated, 20 cc. of purulent material was obtained, and 100,000 units of penicillin was injected into the pleural space. Culture of the aspirated material yielded no growth. The leukocyte count was

*Figure 2.—Roentgenogram following initial pleural aspiration, showing clearing of the left lung field and return of the trachea and mediastinum toward the midline.*

7,600, with 21 percent polymorphonuclear cells, 76 percent lymphocytes, and 3 percent monocytes. The infant's condition was much improved, there was no cyanosis, the respiratory rate was normal, the respirations were regular and equal bilaterally, and the temperature was normal.

On the third hospital day, thoracentesis was again attempted but no pus was obtained. Transfusions of whole blood were given on the third and fifth hospital days. There was no further cyanosis or dyspnea and the physical examination was essentially normal. The infant's appetite improved. A roentgenogram of the chest (fig. 3) was taken on the fifth hospital day, and fluoroscopy confirmed the belief that the density previously described in the left periphery was caused by pleural thickening.

The course thereafter was entirely satisfactory. The temperature remained normal, the appetite improved, and the weight increased. On the eighteenth hospital day the dose of penicillin was reduced to 100,000 units every 6 hours, and on the thirty-third hospital day the drug was discontinued. The infant was

discharged on the thirty-fifth hospital day. Her weight at the time of discharge was 10 pounds 1 ounce. A roentgenogram taken 34 days after the initiation of therapy (fig. 4) showed the lung fields to be completely clear.

## DISCUSSION

Empyema in infancy and childhood occurs most often as a complication of pneumonia. Prior to the advent of sulfonamide and penicil-

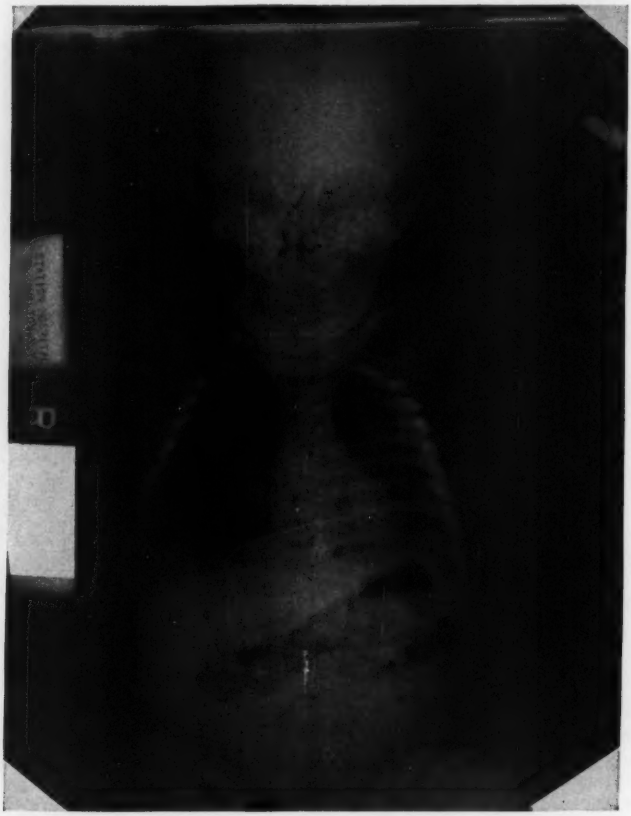

*Figure 3.—Roentgenogram taken on fifth hospital day.*

lin therapy, the pneumococci were the most common causative agents. Next in order of frequency were the hemolytic streptococci, *Staph. aureus*, and rarely the influenza, typhoid, Friedländer, and colon bacilli.[2] Adequate therapy of pneumonia with sulfonamides and/or

[2] LANMAN, T. H., and HEYL, H. L.: Empyema in children. New England J. Med. 221: 1003–1009, Dec. 28, 1939.

penicillin has greatly reduced the incidence of empyema, particularly those forms caused by pneumococci and hemolytic streptococci.[3]

Prior to penicillin therapy, the age of the patient was an important factor in determining the mortality from this disease, with the high case-fatality rates occurring in infants under 2 years of age, and decreasing as the age of the child increased.[4] Thus, Lanman and

*Figure 4.—Roentgenogram showing essentially normal chest.*

Dimmler,[5] reporting a series of 467 children with empyema, found the case-fatality rate among those under 2 years of age to be about twice

[3] NELSON, W. E.: Mitchell-Nelson Textbook of Pediatrics. 5th edition. W. B. Saunders Co., Philadelphia, Pa., 1950, pp. 1011–1015.

[4] PENBERTHY, G. C., and BENSON, C. D.: Management and treatment of empyema in children. Am. J. Surg. 39: 267–274. Feb. 1938.

[5] LANMAN, T. H., and DIMMLER, C. L., JR.: Management of acute empyema in children. Am. J. Surg. 54: 29–34, Oct. 1941.

as great as in the total group. Likewise, Wallace,[6] reviewing the several types of treatment in 348 cases of empyema in children, noted a case-fatality rate of 57.4 percent in children under 2 years treated conservatively (i. e., with repeated aspiration, drainage by cannula aspiration, or drainage by closed suction) as compared with a rate of 30.9 percent for the total group of children treated by these methods, and a rate of 37.1 percent in children under 2 years treated radically (i. e., by thoracotomy with or without resection of a rib) as compared to a rate of 14.9 percent for all children treated by these means.

The treatment of empyema before the advent of penicillin was varied. Simple aspiration of the pleural cavity repeated at frequent intervals, intercostal drainage, and rib resection with closed or open drainage were the most frequently recommended methods, and conflicting reports of the efficacy of each method were numerous.[4-7] With the advent of penicillin, this situation was dramatically changed. Oberhofer-Sik[8] reported 33 patients treated with penicillin intrapleurally, with 29 cured. Davis, Hyman, and Ruhstaller[9] reported 7 patients with staphylococcic pneumonia and empyema, with 6 cures and 1 death. Prince and Temple[10] reported 9 patients, 6 of whom responded satisfactorily to penicillin and repeated aspiration. The other 3 required additional surgical drainage.

The important points in the therapy of empyema in childhood are: (*a*) early institution of adequate antibiotic therapy, both intramuscular and intrapleural routes being used, continuing this therapy long enough to ensure against relapse, despite the early finding of sterile aspirations; (*b*) repeated thorough evacuations of the affected pleural space by aspiration; and (*c*) supportive measures, including transfusions, oxygen, and maintenance of nutrition, including supplementary vitamins. If these measures are applied early, the percent of patients with empyema necessitating surgical drainage can be lowered and a satisfactory outcome may be expected in a large proportion. If trial with these methods in infections caused by antibiotic-sensitive organisms, does not yield satisfactory response within 2 weeks, consideration must then be given to surgical drainage.

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[6] WALLACE, H. L.: Observations on treatment of empyema in children. Brit. M. J. 2: 560–564, Sept. 10, 1938.

[7] ELLENBERG, S. L., and MARTIN, A. T.: Medical and surgical management of empyema in childhood. New York State J. Med. 42: 1243–1247, July 1, 1942.

[8] OBERHOFER-SIK, T.: Das Empyem der Pleurahöhle bei Kindern und dessen erfolgreiche Behandlung mit Penicillin. Ann. pædiat. 170: 200–214, 1948.

[9] DAVIS, W. S.; HYMAN, M. E.; and RUHSTALLER, F. D.: Penicillin as aid in treatment of primary staphylococcus pneumonia with empyema. J. Pediat. 30: 55–63, Jan. 1947.

[10] PRINCE, G. E., and TEMPLE, W. J.: Penicillin in treatment of empyema in children. Am. J. Dis. Child. 74: 447–455, Oct. 1947.

# Repair of a Mandibular Bone Defect With Bone Chips

Otto W. Wickstrom, *Captain, MC, U. S. N.*[1]
Raymond F. Huebsch, *Commander, DC, U. S. N.*[1]

REMOVAL of large bone cysts of the lower jaw via the intraoral route has been an accepted practice for many years. After excision of the tumor the resulting defect is left to granulate and fill with scar tissue and, eventually, with bone. This process requires many months of frequent packing and irrigation of the draining cavity. In large defects of the bone, several years may elapse before regeneration is complete. Many operations for the removal of cysts and benign tumors of the long bones in which the resulting defect has been replaced by bone chips have been recommended. This technic was used in correcting the defect of the mandible following excision of a radicular cyst. In the following case, in view of the large amount of bone destruction, the possibility of a pathologic fracture was apparent. To prevent this and to accelerate recovery a bone graft was performed. Cancellous bone chips were introduced into the bony defect at the time of excision of the cyst. Two complete surgical teams operated on the patient at the same time. At no time during the operation did the two teams contaminate each other. In order to prevent oral contamination of the bony defect, an extraoral approach was made.

## CASE REPORT

A 38-year-old man was admitted to this hospital complaining of a swelling of the right mandible for the previous 6 months. The mass had continued to swell until it had become apparent extraorally (fig. 1). The patient had had an infected lower first molar extracted 6 years before the swelling occurred. Oral examination revealed a large mass lateral to the right mandible, which caused a bulging of the cheek in the molar and bicuspid regions. The mass could be palpated and outlined extraorally. Pressure applied to the area produced a crepitation of the buccal and lingual plates of bone. All teeth in the area

[1] U. S. Naval Hospital, Oakland, Calif.

*Figure 1.—Preoperative view showing extent of the radicular cyst in the right mandible.*

were vital. Roentgenograms of the lateral and anterior-posterior extraoral aspects of the right mandible revealed a large area of radiolucency extending from the mesial root of the second molar to the symphysis of the mandible (figs. 2A and 2B) which had caused definite

*Figure 2A.—Preoperative roentgenogram of radicular cyst in the right mandible.*

*Figure 2B.—Preoperative roentgenogram of radicular cyst in the right mandible.*

expansion and thinning of the bone on the superior and lateral borders. A diagnosis of radicular cyst was made and the patient was prepared for operation.

*Operation*

*Oral surgical procedure.*—Under intratracheal anesthesia with nasal intubation, an incision was made at the lower border of the mandible, extending from the angle to the symphysis. Two percent procaine hydrochloride with epinephrine was infiltrated locally for hemostasis. The soft tissues were reflected upward and the entire buccal plate of the mandible was exposed. The cyst, about the size of a hen's egg, was excised en masse. Hemostasis was secured by gelfoam at the bleeding points in the bony cavity. The cystic contents were examined by the pathologist and found to be sterile. A cancellous bone graft was taken from the left iliac crest, divided into chips, and gently packed in the bony cavity. The soft tissues were sutured over the

defect and a pressure dressing was applied. A drain was inserted to prevent the formation of a hematoma.

*Figure 3.—Postoperative view. The jaw is firmly healed and there is no evidence of recurrence of the cyst.*

*Figure 4.—Postoperative roentgenogram 5 months later shows healing and consolidation of bone chips.*

*Procedure in elevating bone graft.*—An incision was made over the crest of the left ilium. The soft tissues were elevated and retracted and the periosteum was stripped from the bone. The cortical plate of bone at the iliac crest was chiseled off, and a portion of the cancellous bone was chiseled out of the bed. This cancellous bone was divided into chips about the size of half a pea. The periosteum and soft tissues were sutured back in apposition.

*Postoperative course.*—The mandible was immobilized with Ivy loops and intermaxillary elastics to restrict the mandibular movements in order not to displace the bone graft by muscular activity. Penicillin, a liquid diet, and moderate sedation for pain were prescribed. The patient noted parasthesia of his lower lip and chin, which was to be expected after an operation of this sort; otherwise the postoperative course was uneventful. On the sixth postoperative day, the sutures were removed. The incision healed by primary intent (fig. 3). Periodic roentgenograms were taken, and by the fifth postoperative month, the bone chips appeared completely homogeneous and viable (fig. 4). The parasthesia of the lower lip persisted for 3 months, after which all sensation was normal. Soon after the operation, vitality tests of the molar and bicuspid teeth, whose roots were exposed in the cyst, were negative, but by the end of the second postoperative month they gave positive responses to cold, heat, electricity, and the bur, so they were not extracted.

# The Use of the Anterior Iliac Crest as a Source of Bone Graft

THOMAS H. CROUCH, *Lieutenant Colonel, U. S. A. F. (MC)*[1]

THE use of iliac bone as a source of bone graft, particularly when cancellous bone is desired has become popular in the last decade. This popularity is justified because of the ready availability of the bone, the general lack of complications following the removal of the graft from the donor site, and the usual rapidity with which the cancellous bone from the ilium unites with the recipient bed. Although most orthopedic surgeons remove a portion of the posterior iliac crest as a source of bone graft material when performing a fusion of two or more of the spinal vertebrae, less hemorrhage is produced and less persistent postoperative pain develops in the donor site if the anterior crest is used. Furthermore, a larger supply of bone graft material may be secured from the anterior crest of the ilium without fear of imposing a structural defect in the pelvic girdle than when the posterior crest is removed. For these reasons the practice at this hospital has been to use the anterior crest of the ilium as a source of bone grafts.

Ordinarily the use of bone as a graft is an elective procedure and the donor site is prepared for operation 48 hours in advance by a thorough scrubbing with green soap and peroxide followed by copious lavage with sterile water, followed by ether and 70 percent alcohol. The crest of the ilium is then draped with sterile towels held in place with adhesive strips and 24 hours before operation the process of sterile preparation is repeated. On the day of operation the patient is given a general or spinal anesthetic and the donor site is further prepared by painting with an antiseptic. An incision carried through to the periosteum is made following the iliac crest to the anterior-superior iliac spine. The periosteum is incised longitudinally at the mid-portion of the crest to the anterior-superior iliac spine and is stripped from the ilium, using a sharp bone chisel to cut the strong fibrous attachments of the gluteal muscles and the abdominal muscles at their iliac attachments. The iliacus strips from the pelvic surface of the ilium

[1] Fitzsimons Army Hospital, Denver, Colo.

with ease and is best stripped with a periosteal elevator or may be stripped with a sterile sponge over the gloved finger. The strong tendinous attachments of the sartorius, the tensor fasciae latae, and the inguinal ligament to the anterior-superior iliac spine are best cut away from the bone with sharp dissection, care being taken to avoid the lateral femoral cutaneous nerve.

The bone is best secured by cutting away the desired amount with a sharp osteotome, cutting the outer cortex starting from a point below the anterior-superior iliac spine, directing the incision posteriorally and angling toward the crest of the ilium at the point desired. The inner cortex is then cut and the graft is removed and placed in sterile normal saline solution. The cut edges of the ilium are impacted and, if bleeding is excessive, are covered with fibrin foam, oxycel, gelfoam, or a similar product. The large bleeding points are secured and tied. The muscles are reapproximated by interrupted sutures through the myofascial junctions. The deep fascia is reapproximated with interrupted sutures, particular care being taken to incorporate the origins of the sartorius and tensor fasciae latae with the inguinal ligament. Subcutaneous tissue and skin are closed in the usual manner. A rubber tissue drain placed subcutaneously and removed in 24 hours prevents the formation of hematomas and the possible disruption of the wound later. The graft is cleansed of all soft tissue, fashioned with a motor saw into the shape desired, and placed in normal saline solution until needed.

TABLE 1.—*Type of operation in which iliac bone was used as graft*[1]

| | |
|---|---|
| Fusions of 2 or more spinal vertebrae: | |
| Cervical | 4 |
| Thoracic | 12 |
| Thoracolumbar | 16 |
| Lumbar | 8 |
| Lumbosacral | 63 |
| Total | 103 |
| Operations on the tibia | 15 |
| Operations on the femur | 12 |
| Operations on the humerus | 9 |
| Operation on the radius | 3 |

[1] The remainder of the cases included arthrodeses of the wrist, elbow, shoulder, ankle, and sacro-iliac joints.

Iliac bone was used as a source of graft in a series of 150 operations performed at this hospital in the calendar years 1948 and 1949 (table 1). The indication for spinal fusion in 5 patients was the existence of a pseudarthrosis secondary to a previous spinal fusion performed else-

where by a different technic. In 3 of these patients the two-screw technic of lumbosacral fixation in which the screws were directed through the facets of the lumbosacral articulation failed. In the other 2 patients tibial bone grafts had been used but had failed to fuse. All 5 responded well to a modified Hibbs' fusion in which a massive amount of iliac bone was used as a graft. Clinically and roentgenologically the pseudarthroses were cured.

## COMPLICATIONS

In 17 patients in this series complications occurred at the recipient graft site. Aseptic nonunion of the grafted bone occurred in 6 of these, the grafted cancellous bones seeming to melt away from the site of implantation with no evidence of infection or other complication. In the remaining 11 a septic nonunion occurred with development of draining sinuses or evidence of frank osteomyelitis. In 9 of these patients osteomyelitis had existed in the site of the implantation of the new bone graft prior to the operation but had been quiescent for varying lengths of time. Most of these infections had followed compound comminuted fractures incurred in battle. The reason for the implantation of new bone was to bridge a bony defect. Four complications occurred at the donor site; 3 of these were hematomas beneath the line of incision with subsequent spreading of the incision and healing by second intent without further complication. The fourth was a transection of the lateral femoral cutaneous nerve with the development of a painful neuroma that required resection. Nearly all of these patients complained of more postoperative pain at the donor than at the recipient site. This pain subsided rapidly and no persistent hyperalgesia was noted except in the patient who developed a neuroma.

In 25 of the patients operated on, nonunion of fractures existed as the indication for bone grafting with the use of the bone fragments. The 9 patients in whom a previously quiet osteomyelitis was reactivated were those who were operated on the shortest time after the drainage had stopped. With increasing intervals between the cessation of drainage from an old wound and the implantation of a bone graft the likelihood of the graft taking without complication was enhanced. As a result of this experience it is the custom of the orthopedic section at this hospital to wait a minimum of 1 year between the cessation of drainage from a previously existing osteomyelitis and any reconstructive operation involving the use of a bone graft. The present widespread use of antibiotics has not altered the concept that bone grafting in the presence of infection is not only futile but dangerous to the patient.

Two patients with continued nonunion after the use of iliac bone as a graft had sequestration of the cancellous chips implanted about the site of the nonunion and developed a draining sinus. On the removal of the nonviable implant the drainage stopped and the wound healed without further complication. These cases are not considered as being osteomyelitis but as being foreign body reactions. In any event they contributed to the continued nonunion of the fracture being treated.

The anterior iliac crest is a generous source and in view of the fact that frequently all of the bone is not used, an opportunity to keep the bone bank well stocked with good bone is provided.

## CONCLUSIONS

The iliac bone furnishes a readily available source of cancellous bone for use as graft. Securing the bone graft from the anterior crest of the ilium is technically easier, provides more bone without complication, and results in less loss of blood and less residual pain than when the posterior crest of the ilium is resected. Under ordinary circumstances the cancellous bone secured from the ilium is readily incorporated in the recipient site. An interval of at least 1 year should be allowed before bone grafting is attempted in an area formerly the site of osteomyelitis. Despite the use of antibiotics the implantation of a bone graft in the face of infection is useless and dangerous.

# Fabrication of a Porcelain Jacket Crown

FRANCIS W. SHAFFER, *Captain, DC, U. S. A.*[1]

IN AN effort to simplify the fabrication of a porcelain jacket crown the following procedure is recommended. A Steele's facing (Army-Navy Catalog of Medical Matériel Item No. 5–605–250) is used and a porcelain lingual baked onto it. Porcelain for the lingual made by the manufacturer of the facing porcelain should be selected in order to get a homogeneous fusing of the two porcelains. The Steele's facing is ground out on the lingual surface, and adapted to the platinum covered prepared tooth. This hollowed-out facing is luted into position with sticky wax, from the lingual surface, to the 0.001-inch platinum cap covering the amalgam die of the prepared tooth. The stone model with the die in place, as well as the placed facing, is well lubricated with liquid petrolatum, and a stone matrix or splint is placed on the labial area. After the stone matrix has hardened it is removed, then the wax is removed from the porcelain facing and platinum cap. By placing the facing in the stone matrix, and the matrix on the stone model, damp porcelain can be vibrated onto the lingual surface of the platinum cap, and built up to the desired form. The unprocessed crown is removed and given a low biscuit bake. Two or three successive bakes are then made and a professional looking jacket crown will result.

By the use of this short-cut an excellent crown can be made that will give an esthetic, well-fitting, all porcelain jacket crown.

[1] 5th Army Central Dental Laboratory, St. Louis Medical Depot, St. Louis, Mo.

# Demerol, Scopolamine, and Caudal Analgesia[1]

## Results in 700 Cases

WILLIAM W. MANSON, *Commander, MC, U. S. N.*

EVER since Edwards and Hingson's article [2] on their use of continuous caudal analgesia appeared in 1942, the literature has contained numerous reports on this method of relief of pain during labor. Many of these reports [3-7] have favored this procedure but as evidence of its decreasing popularity, the 1947 Year Book of Obstetrics and Gynecology [8] failed to report on a single article dealing with caudal analgesia. In 1945 Nicodemus, Ritmiller, and Ledden [9] reported their experience with continuous caudal analgesia in obstetrics at a group clinic staffed by full-time obstetricians. They concluded that labors were longer, uterine contractions were of less intensity, the expulsive forces of the abdominal muscles were lost, occiput posterior positions rotated less often, and operative deliveries were increased. Since that time, in an effort to correct these faults of caudal analgesia, the following method of the management of labor has been evolved at the George F. Geisinger clinic with the following results in 700 consecutive vaginal deliveries during the period from 1 July 1948 to 15 March 1949.

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[1] Department of Obstetrics, George F. Geisinger Memorial Hospital, Danville, Pa.

[2] EDWARDS, W. B., and HINGSON, R. A.: Continuous caudal anesthesia in obstetrics. Am. J. Surg. **57**: 459–464, Sept. 1942.

[3] HINGSON, R. A., and EDWARDS, W. B.: Continuous caudal analgesia in obstetrics. J. A. M. A. **121**: 225–229, Jan. 23, 1943.

[4] HINGSON, R. A.; EDWARDS, W. B.; LULL, C. B.; ET AL.: New-born mortality and morbidity with continuous caudal analgesia; analysis of cases in New York, Philadelphia, and Memphis, with controls. J. A. M. A. **136**: 221–229, Jan. 24, 1948.

[5] HODGES, W. R.: Continuous caudal analgesia in obstetrics; 300 cases. J. A. M. A. **125**: 336–341, June 3, 1944.

[6] LULL, C. B.: The present status of continuous caudal and spinal analgesia in obstetrics. M. Clin. North America **32**: 1683–1697, Nov. 1948.

[7] MASTERS, W. H.: Continuous caudal analgesia; a report of 1,500 consecutive cases. Am. J. Obst. & Gynec. **56**: 756–761, Oct. 1948.

[8] GREENHILL, J. P. (editor): The 1947 Year Book of Obstetrics and Gynecology. The Year Book Publishers, Inc., Chicago, Ill., 1948. pp. 141–143.

[9] NICODEMUS, R. E.; RITMILLER, L. F.; and LEDDEN, L. J.: Continuous caudal analgesia in obstetrics on trial. Am. J. Obst. & Gynec. **50**: 312–318, Sept. 1945.

## MANAGEMENT OF LABOR

When labor had become definitely established, as evidenced by the quality and frequency of the uterine contractions and the progressive dilatation and effacement of the cervix, the patient received an initial dose of 100 mg. of demerol and 0.6 mg. of scopolamine. The timing of this initial dose depended on the stoicism and the pain threshold of the individual patient. Generally, primiparas received this medication when their pains were of good quality, occurred as often as every 3 minutes, and the cervix was dilated 4 cm. The timing of the administration of demerol and scopolamine to multiparas depended on parity, history of rapidity of previous labors, strength and frequency of labor pains, dilatability of the cervix, and, above all, the experience and clinical judgment of the attending obstetrician. In both primiparas and multiparas, if labor was still active 1 hour after the administration of the first analgesic, 100 mg. of demerol were given and repeated thereafter at 1- to 2-hour intervals, depending on the progress of labor. Scopolamine was seldom repeated after the initial dose.

Caudal analgesia was induced in primiparas when the cervix was nearly or fully dilated and the vertex in a normal anterior position. In multiparas caudal analgesia was induced when the cervix was dilated, 6 to 8 cm., depending on the activity of labor and the position of the presenting part.

## TECHNIC OF CAUDAL ANALGESIA

The malleable needle technic with 1.5 percent metycaine as the anesthetic agent was used for caudal analgesia. Several innovations not previously described were also applied. Figure 1 shows a readily constructed wooden stand to hold the caudal tray and figure 2, the tray at the patient's bedside. Figures 3 and 4 show a caudal roll that was used to keep the patient's weight off her abdomen while lying prone to facilitate insertion of the caudal needle.

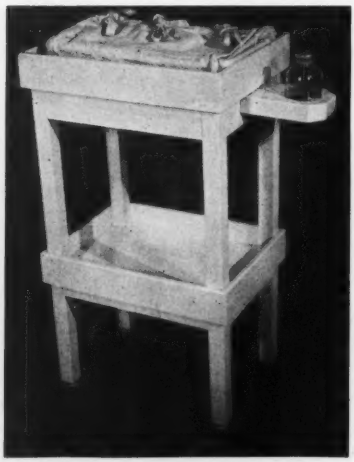

*Figure 1.—Caudal tray stand.*

After inserting the malleable needle, careful aspiration determined that the subdural space had not been entered. Eight cubic centimeters of the metycaine solution was then injected and in 5 minutes, if there was no paralysis of the lower extremities and again

*Figure 2.—Caudal tray.*

after careful aspiration, the remaining 22 cc. of the initial 30 cc. dose was injected. If by then the head was visible and the patient was judged to be ready for delivery, the caudal needle was removed and the patient was placed on the delivery table. If the patient was not ready for delivery, the continuous caudal analgesia apparatus was connected as described by Lundy.[10] Further doses of 20 cc. of the metycaine solution were administered every 30 to 45 minutes according to the level of anesthesia as determined by pin-prick (the optimum level of anesthesia was at the umbilicus) and the patient's subjective complaint of returning pain. The average total amount of 1.5 percent metycaine administered to primiparas was 50 cc. and to multiparas, 46 cc. The average duration of the caudal analgesia, as measured from the time of the first injection of metycaine until

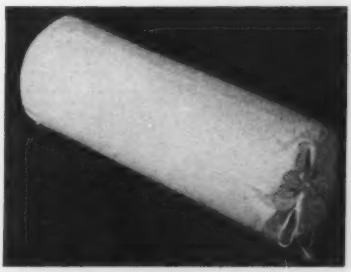

*Figure 3.—Caudal roll (length 18 inches, diameter 6 inches).*

[10] LUNDY, J. S.: Continuous caudal anesthesia in obstetrics. S. Clin. North America 25: 841–857, Aug. 1945.

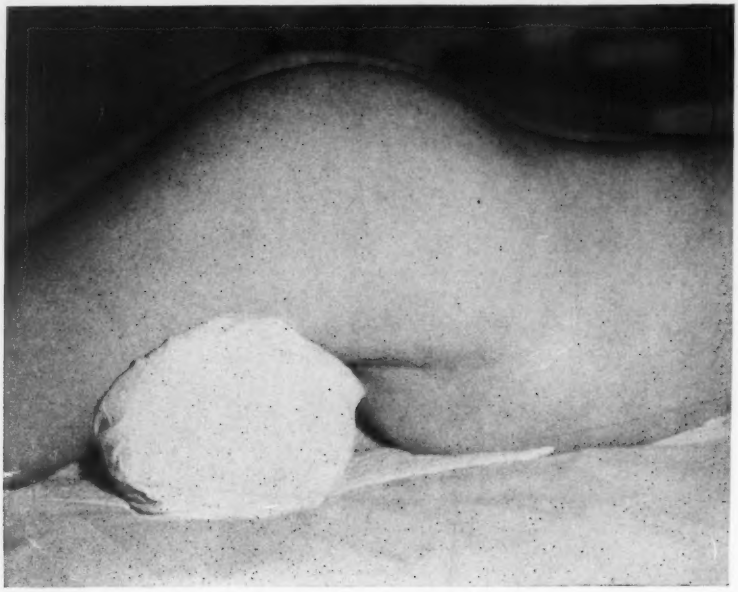

*Figure 4.—Patient on caudal roll.*

completion of the delivery (including any repair necessary), was 1 hour and 15 minutes for primiparas and 56 minutes for multiparas.

Careful check on maternal blood pressure and fetal heart rate was kept throughout labor. If there was a decided fall in blood pressure, 50 mg. of ephedrine was administered and the patient's lower extremities were raised for autotransfusion.

## RESULTS

Of the 700 consecutive patients delivered, 320 were primiparas and 380 were multiparas. The average lengths of the various stages of labor were shorter than those given in the standard textbooks of obstetrics (table 1). Maintaining demerol and scopolamine analgesia closer to the time of delivery before administering the caudal analgesic resulted in 51 percent spontaneous deliveries (table 2) as compared to 39.2 percent spontaneous deliveries reported by Nicodemus et al.[9] In an effort to reduce the incidence of persistence occiput posterior presentation, 43.5 percent of the patients in this series were examined vaginally in order to determine accurately the position of the presenting part prior to administering the caudal analgesic. If anterior rotation had not occurred, the patient was given every opportunity to accomplish this prior to inducing caudal analgesia. In the

report of Nicodemus et al., 10.6 percent of the patients required forceps or manual rotations as compared to 6.3 percent in our series.

TABLE 1.—*Parity and average duration of labor*

| | Number of patients[1] | First stage | Second stage | Third stage |
|---|---|---|---|---|
| Primiparas | 320 | 9 hr. 23 min | 1 hr. 30 min | 2.3 min. |
| Multiparas | 380 | 5 hr. 51 min | 51.2 min | 2.6 min. |
| Total | 700 | | | |

[1] Infants, 704 (4 sets of twins).

TABLE 2.—*Type of delivery and obstetrical operation*

| | Number | Percent of total | | Number | Percent of total |
|---|---|---|---|---|---|
| Spontaneous | 359 | 51.0 | Forceps rotation: | | |
| Low forceps | 285 | 40.5 | Posterior | 9 | 1.3 |
| Mid forceps | 25 | 3.5 | Transverse | 6 | .8 |
| Persistent occiput posterior | 46 | 6.5 | Breech-fundal pressure | 22 | 3.1 |
| Deep transverse arrest | 18 | 2.5 | Breech extraction | 5 | .7 |
| Manual rotation: | | | | | |
| Posterior | 35 | 5.0 | | | |
| Transverse | 12 | 1.7 | | | |

TABLE 3.—*Maternal complications*

| | Number | Percent of total | | Number | Percent of total |
|---|---|---|---|---|---|
| Infection (pyelitis, phlebitis, and endometritis) | 17 | 2.40 | Required retention catheter | 51 | 7.30 |
| Maternal death | 1 | .14 | Postpartum hemorrhage | 9 | 1.28 |
| Required catheterization | 220 | 31.40 | Fall in blood pressure requiring ephedrine | 9 | 1.28 |

## COMPLICATIONS

The maternal complications that occurred in this series are noted in table 3. Despite the high incidence of vaginal examinations during labor, mild infection occurred in only 2.4 percent; this is not excessively high. Most of these manifested themselves as phlebitis or pyelitis; and there were no serious cases of endometritis. The single maternal death occurred in a patient who developed phlegmasia alba dolens and died suddenly at home 3 weeks postpartum. Although there was no postmortem examination, it seemed probable that the cause of death was pulmonary embolism.

The only annoying complication was postpartum urinary retention; 7.3 percent of the patients required a retention catheter for the relief of this condition. It was found that the incidence of this complication could be lowered by careful postpartum observation of the patient's bladder to insure that it did not become overdistended prior

to the return of the urge to void. Thirty-one and four-tenths percent of the patients required postpartum catheterization to prevent overdistension of their bladders.

The low incidence of postpartum hemorrhage (blood loss of 500 cc. or over) confirmed the observations of others of this advantage of delivery under caudal analgesia. Only 9 patients had a fall in blood pressure sufficient to require the administration of ephedrine and no maternal or fetal difficulty was attributable to these transient hypotensions.

There were no cases of postpartum headache, infections at the site of insertion of the caudal needle, neuropathies, or other maternal complications.

## FETAL MORTALITY

One of the great advantages of conduction anesthesia for delivery is evident in the fact that 93.42 percent (table 4) of the infants cried spontaneously at birth. The fact that there were only 7 stillborns and 10 neonatal deaths was also remarkable. Two of the stillborns weighed less than 1,500 grams (table 5) and, therefore, were in the so-called previable weight group. One of the stillborns was a macerated premature infant weighing 1,530 grams at birth, whose mother was admitted to the hospital with diabetic acidosis. The remaining 4 were full-term infants, one macerated and the other 3 dying during labor from undetermined causes.

TABLE 4.—*Condition of newborn infants*

| | Number | Percent of total |
|---|---|---|
| Apneic at birth | 43 | 6.1 |
| Spontaneous cry | 654 | 93.4 |
| Stillbirths | 7 | 1.0 |
| Neonatal deaths | 10 | 1.4 |

TABLE 5.—*Stillborn infants*

| | |
|---|---|
| Term | 4 |
| Prematures (1,500–2,500 grams) | 1 |
| Previable (less than 1,500 grams) | 2 |
| Congenital abnormalities | 0 |
| Total | 7 |

Four of the ten neonatal deaths (table 6) were due to congenital abnormalities incompatible with life (two had congenital heart disease, one had spina bifida, and one had congenital cystic kidneys). One of the ten weighed 1,000 grams and would, therefore, fall in the previable weight group. Five of the ten neonatal deaths were prema-

ture infants. The only full-term infant born alive who died and did not have a congenital abnormality definitely incompatible with life weighed 3,820 grams at birth and died 14 hours later. Autopsy revealed congenital atelectasis.

TABLE 6.—*Neonatal deaths*

| | |
|---|---|
| Term | 4 |
| Premature | 5 |
| Previable | 1 |
| Total | [1] 10 |

[1] 4 congenital abnormalities (3 term and 1 premature).

There were 41 premature infants weighing between 1,500 and 2,500 grams, an incidence of prematurity of 5.82 percent in this series. Thirty-five of these premature infants were born alive and survived and six of them were either stillborn or died neonatally, giving a gross fetal mortality rate of 14.63 percent. One of the six premature infants who failed to survive was the stillborn macerated infant born to the mother admitted with diabetic acidosis; another premature infant died of congenital cystic kidneys, previously mentioned, and the remaining four prematures died neonatally—one from cerebral hemorrage and three from undetermined causes.

## RESULTS OF ANALGESIA

The same observer questioned each one of the 700 patients within 48 hours of their delivery. How the patient felt about the success of her analgesia is shown in table 7.

TABLE 7.—*Results of analgesia*

| Result | Primiparas | | Multiparas | |
|---|---|---|---|---|
| | Number | Percent of total | Number | Percent of total |
| Precaudal: | | | | |
| Ideal | 201 | 62.8 | 187 | 49.2 |
| Good | 50 | 15.6 | 63 | 16.6 |
| Poor | 59 | 18.4 | 90 | 23.6 |
| Failure | 10 | 3.1 | 40 | 10.5 |
| Caudal: | | | | |
| Ideal | 295 | 92.2 | 317 | 83.4 |
| Good | 5 | 1.5 | 6 | 1.5 |
| Poor | 8 | 2.5 | 13 | 3.4 |
| Failure | 12 | 3.7 | 44 | 11.6 |

*Precaudal analgesia.*—If the patient remembered nothing of her labor shortly after the first injection of demerol and scopolamine, the result was classed as ideal. If she remembered very little or believed that the injections relieved a great deal of her pain, the result was classed as good. If she admitted to little relief from her precaudal

analgesia, the result was classed as poor, and if she received no relief or time did not permit the precaudal analgesia to become effective, the result was classed as a failure. The main causes for the poor results and failures in this series were: (*a*) lack of time for the demerol and scopolamine to become effective because labor was too far advanced when the patient was admitted to the hospital or because of too rapid progress of labor; and (*b*) inexperience of the obstetrician in the correct timing of the administration of the drugs. The patients of the senior members of the group consistently reported better results than did those of the younger members.

*Caudal analgesia.*—If the patient received complete relief from pain shortly after administration of the caudal analgesia, the result was classed as ideal. If the patient recalled slight pain during delivery but the accoucheur believed the caudal analgesia was effective, the result was classed as good. If relief from pain was incomplete or one-sided as evidenced by the patient's reactions during labor but still no supplementary anesthesia was required for delivery, the result was classed as poor. If the caudal analgesia did not relieve the pain of uterine contractions or delivery or if for any reason caudal analgesia was not attempted, the result was classed as a failure. The most frequent cause of unsuccessful caudal analgesia (table 8) was insufficient time for its administration—often the patient entered the hospital ready for delivery or the progress of labor was misjudged. In only 12 cases was it impossible to insert the malleable needle into the caudal canal. Recognized bony abnormality of the sacrum was the cause of four of these failures and thick fat pads over the sacrum caused two. The cause of the other six failures was undetermined. In 28 patients, although the operator believed that the caudal needle was accurately placed in the caudal canal, satisfactory pain relief was not obtained and the reason for these unsuccessful caudal analgesias could not be determined.

TABLE 8.—*Reasons for unsuccessful caudal analgesia*

| Reason | Primiparas | Multiparas | Reason | Primiparas | Multiparas |
|---|---|---|---|---|---|
| No time | 1 | 14 | Adiposity over sacrum | 2 | 0 |
| Labor misjudged | 0 | 15 | Bony abnormality of sacrum | 2 | 2 |
| Unable to insert needle—cause unknown | 2 | 4 | Patient's request not to have caudal analgesia | 0 | 1 |
| Aspiration of blood | 0 | 2 | Labor failed to progress after inducing caudal analgesia | 0 | 1 |
| Aspiration of spinal fluid | 1 | 0 | Cause undetermined | 11 | 17 |
| Pilonidal cyst | 0 | 1 | | | |

## SUMMARY

In 1945 the results of 500 deliveries under continuous caudal analgesia at the George F. Geisinger Memorial Hospital were reported

and it was concluded that labors were longer, occiput posteriors rotated less often, and operative deliveries were increased. As a follow-up, 700 consecutive vaginal deliveries occurring in the same closed staff institution from 1 July 1948 to 15 March 1949, were studied in an effort to discover what change had evolved in the management of labor to remedy the few handicaps of this method of analgesia.

In this series, demerol and scopolamine were used to induce analgesia in the first stage of labor, making it possible to administer caudal analgesia late in the first stage or in the second stage of labor. Labors were shorter, the incidence of forceps deliveries was reduced, and the incidence of persistent occiput posterior positions requiring rotation was reduced. Postpartum urinary retention requiring retention catheters in 7.3 percent of the patients was the most annoying maternal complication in this series. Maternal morbidity was low despite the high incidence of vaginal examinations during labor. The incidence of postpartum hemorrhage was unusually low. The single maternal death occurred at home 3 weeks postpartum and was probably due to a pulmonary embolus. Ninety-three percent of the infants cried spontaneously at birth. The gross still birth rate was 1 percent and the gross neonatal death rate was 1.4 percent, giving a gross or uncorrected fetal mortality rate of 2.4 percent.

The incidence of premature births was 5.85 percent and the gross fetal mortality rate for premature infants was 14.63 percent.

Seventy-eight and five-tenths percent of the primiparas and 66 percent of the multiparas received ideal or good relief from the demerol and scopolamine analgesia. Caudal analgesia was successful in 94 percent of the primiparas and 85 percent of the multiparas.

## CONCLUSIONS

By the use of demerol and scopolamine analgesia in the first stage of labor, the caudal analgesic may be administered closer to the time of delivery resulting in: (*a*) shorter labors; (*b*) lower incidence of operative deliveries; and (*c*) lower incidence of persistent occiput posterior positions.

Demerol-scopolamine-caudal analgesia in the hands of a group clinic of trained obstetricians is a safe and effective method of inducing analgesia as evidenced by: (*a*) spontaneous crying at birth of 93 percent of the infants; (*b*) a gross or uncorrected fetal mortality rate of 2.4 percent; and (*c*) successful caudal analgesia in 89 percent of this series of 700 consecutive vaginal deliveries without maternal mortality or injury attributable to the analgesic.

# Antibiotics in Gastrointestinal Surgery[1]

JOSEPH R. SHAEFFER, *Colonel, MC, U. S. A.*[2]
EDWIN J. PULASKI, *Lieutenant Colonel, MC, U. S. A.*[2]

THE gastrointestinal tract is a tube, lined by a moist mucous membrane, extending from the mouth to the anus. It is normally inhabited by micro-organisms, the type and variety bearing some relation to the character and quantity of food ingested. Under normal conditions, these organisms are useful saprophytes which decompose proteins and carbohydrates and synthesize vitamins. Invasion of the deeper strata by these organisms occurs through disturbance of normal function such as inflammatory disease, vascular impairment, luminal obstruction or injury, and the saprophytes may become pathogens in their new environment. With tissue death, further invasion occurs through the bowel wall into the contiguous tissues or into the peritoneal cavity. In the peritoneal cavity, dissemination is rapid and the process may become generalized. Many studies have been made on the bacteria present in the gastrointestinal tract. The constituent flora in the order of frequency are *Escherichia coli* and coliform bacilli, nonhemolytic streptococci and other micrococci, clostridia, bacteroides, and yeasts. Normally, only small numbers of micrococci and nonhemolytic streptococci are present in the stomach and duodenum. The number and variety of organisms in the small intestine increases gradually in passing distally until the colon is reached, where the bacteria harbored within it approximate 100 million per gram of wet stool. All combinations of these bacteria may produce peritonitis or interfere with healing of the diseased or injured intestine.

Healing in the bowel wall, as in other tissues, is optimal with adequate blood supply and a sterile field. To establish this sterile field

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[1] Presented 6 April 1950 before the Medical Corps Section, Fourth Army Medico-Military Symposium, Fort Sam Houston, Tex.

[2] Brooke Army Hospital, Fort Sam Houston, Tex.

in gastrointestinal operations has been a challenge to all general surgeons. Heavy bacterial implantation into surgically traumatized tissue throws an added handicap on the repair mechanism, which is now required not only to bridge the gap established, but also to eliminate the invading bacteria and their deleterious effects. Failure to obtain gastrointestinal sterilization has been a major deterrent in the progress of surgery in this field. Good technical performance has often met with defeat because of infection occurring in suture lines, mural abscess, resultant leakage, and peritonitis. This complication is still the most common single cause of failure in gastrointestinal operations. To meet this challenge several chemotherapeutic agents have been employed with gratifying results.

Prior to the availability of chemotherapeutic agents, preparation for intestinal operations was almost entirely dependent on starvation and elimination. These principles are still valid in that an empty bowel is usually at physiologic rest and has a significantly reduced bacterial content. Enemas and mild catharsis, when indicated, remain initial steps in preparing the patient for operation. Today although parenteral therapy is available for amelioration of starvation, intestinal antiseptics aid and implement mechanical cleansing.

The effectiveness of any agent used in bowel sterilization is dependent on several factors, namely (*a*) the antibacterial spectrum of the

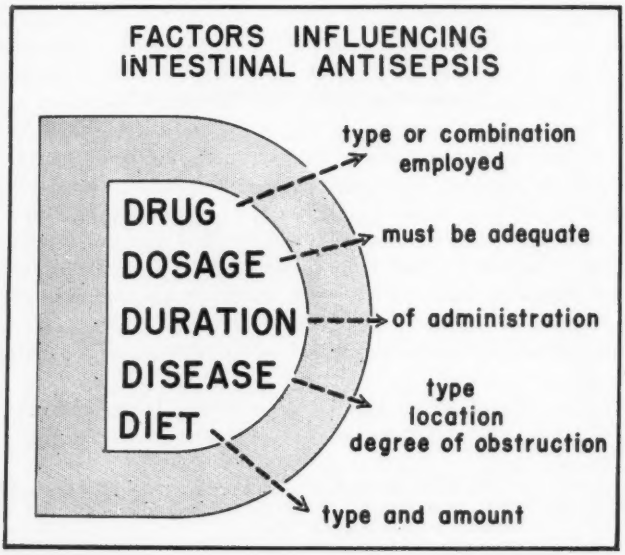


*Figure 1.*

drug, (*b*) the dosage employed, (*c*) the duration of its administration required for optimal bacteriostasis, (*d*) the rapidity of emergence of drug-fast bacteria, (*e*) the quantity of bacteria-laden food ingested, (*f*) the incidence of drug idiosyncrasy or toxicity, and (*g*) the presence of obstruction or nonsterilizable surfaces (fig. 1).

Largely as the result of investigations by Poth [3] the nonabsorbable sulfonamides, sulfasuxidine and sulfathaladine, became accepted as effective drugs in establishing and maintaining a 99 percent elimination of susceptible fecal flora. Their advantages lay in their being poorly absorbed from the intestinal lumen and the low incidence of untoward effects. Although adequate doses of these agents may alter the aerobic flora for periods as long as 6 weeks, it was shown that these agents had no appreciable effect on enterococci, pseudomonas, or proteus organisms.[4] Since the advent of sulfonamide prophylaxis, procedures previously accomplished in two or more stages are now commonly replaced by single-stage primary anastomosis accompanied by a greater sense of security, and with commendable success.

Since 1945, Reimann et al.[5] and Zintel et al.[6] have shown streptomycin orally to be much more effective than sulfonamides against coliform bacteria and enterococci. This drug is nonirritating and, because it is not readily absorbed, is retained in the bowel in relatively high concentration. The coliform organisms are greatly reduced in 48 to 60 hours and suppression can be maintained for 5 to 8 days. Within this time, however, drug-resistant strains appear, causing the total bacterial count to rise to normal in the face of continued therapy. For this reason Lockwood et al.[7] warned that the preoperative use of this antibiotic alone may be dangerous because of the risk of a peritonitis caused by drug-resistant flora following operation. Preoperative oral administration of streptomycin for longer than 3 days is now considered injudicious. Poth et al.[8] and Lockwood showed that no synergistic action accrued when streptomycin was used in combination with sulfathaladine.

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[3] POTH, E. J.: Sulfonamides as therapeutic agents in intestinal antisepsis. collective review. Internat. Abstr. Surg. 78: 373–380, 1944; in Surg., Gynec. & Obst. May 1944.

[4] FIROR, W. M.: Intestinal antisepsis with sulfonamides. Ann. Surg. 115: 829–832, May 1942.

[5] REIMANN, H. A.; ELIAS, W. F.; and PRICE, A. H.: Streptomycin for typhoid; pharmacologic study. J. A. M. A. 128: 175–180, May 19, 1945.

[6] ZINTEL, H. A.; WILEY, M.; NICHOLS, A. C.; and RHOADS, J. E.: Use of streptomycin in surgical patients. Surgery 21: 175–183, Feb. 1947.

[7] LOCKWOOD, J. S., ET AL.: Appraisal of oral streptomycin as an intestinal antiseptic with observations on rapid development of resistance of Esch. coli to streptomycin. Ann. Surg. 129: 14–21, Jan. 1949.

[8] POTH, E. J.; MCNEIL, P.; MANHOFF, J., JR.; KING, B.; and SINCLAIR, G.: Healing of bowel as influenced by sulfasuxidine and streptomycin. Surg., Gynec. & Obst. 86: 641–646, June 1948.

The superiority of streptomycin in effecting rapid reduction of the fecal bacterial count stimulated search for a supplemental agent to block emergence of dangerous drug-resistant bacteria. Pectin compounds give subjective relief in patients with various diarrheas. This effect is believed to be caused by the metabolism and the liberation of a uronic acid radical. Metallic pectinates have been shown to be bacteriostatic independent of their low *p*H values.[9] Streptomycin, when used in combination with aluminum pectinate, has proved to be more effective in the suppression of bacterial flora than when used alone. Not only are the coliform organisms rapidly reduced in numbers, but gram-positive organisms such as the hemolytic streptococcus and clostridia are also suppressed. Experience has demonstrated, however, that the large doses of pectinate required to accomplish this may result in a feeling of fullness and bloating. Moreover, at operation the intestine contains much gelatinous residuum, a condition less desirable than a flat, empty bowel.

Glucurono-lactone, a derivative of glucuronic acid, has been shown to be more effective than the pectin compounds when employed with streptomycin for this purpose.[10] Glucuronic acid is conjugated in the liver and is considered to be the principal agent by which various drugs are detoxified. The combination of streptomycin and glucurono-lactone employed is not accompanied by undesirable side effects and produces pronounced suppression of predominating bacteria in 48 to 60 hours. Fecal antisepsis may be maintained for comparatively long periods. On discontinuing the drug, a normal flora does not reappear before 48 hours. Furthermore, streptomycin-resistant strains do not seem to predominate in this new growth.

The newer antibiotics, aureomycin and chloramphenicol, exert an effect on intestinal bacteria intermediate between that of the sulfonamides and streptomycin. In contrast both are readily absorbed. Aureomycin by mouth has been advocated for the surgical preparation of the bowel by several authorities. A recent publication of the Mayo Clinic [11] concludes: "Aureomycin is the most effective substance we have found for removing bacteria from the intestinal tract of man." Pulaski [10] in a prior study demonstrated that although significant reduction in the flora did occur, it was "of lesser magnitude than

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[9] WOOLRIDGE, W. E., and MAST, G. W.: Effects of uronic acids; pectins and pectinates on the enteric flora, alone and in combination with antibiotics; in vitro studies. Am. J. Surg. 78: 881–886, Dec. 1949.

[10] PULASKI, E. J., and CONNELL, J. F., JR.: Control of peritoneal infection in gastrointestinal surgery. Bull. U. S. Army M. Dept. 9: 265–270, Apr. 1949.

[11] DEARING, W. H., and HEILMAN, F. R.: The effect of aureomycin on the bacterial flora of the intestinal tract of man; a contribution to preoperative preparation. Proc. Staff Meet., Mayo Clin. 25: 87–102, Feb. 15, 1950.

that obtained from sulfonamides or streptomycin," and therefore of questionable value. Subsequently, Metzger and Shapse [12] duplicated this work and obtained results "in close agreement with those of Pulaski." They further demonstrated that with aureomycin a definite overgrowth of proteus organisms occurred, concomitant with the coliform suppression to such an extent that "the total gram-negative count in the weighed stool far exceeded the normal count." Aureomycin, therefore, still has to be proved a superior agent in the establishment and maintenance of intestinal antisepsis. In addition, it is expensive.

Chloramphenicol, like aureomycin, causes *Esch. coli* to disappear gradually. The total bacterial count falls and then rises, with *Esch. coli* as the predominant organism. After initial suppression has terminated, the bacterial counts tend to rise above pretreatment levels and remain high, decreasing only after the drug has been discontinued. It, therefore, possesses no unique features as a preoperative intestinal antiseptic. Like aureomycin presently, it is a comparatively expensive drug.

The action of polymixin is qualitatively similar to that of streptomycin, except that drug fastness apparently does not occur and proteus and gram-positive organisms are unaffected. Likewise, it is not absorbed from the gastrointestinal tract. Further evaluation of this drug is necessary. At present, polymixin is commercially unavailable.

No single drug or combination of drugs may be considered ideal. Each has appreciable effectiveness; each its limitations. From initial laboratory evaluation and clinical experience two types of drugs appear to be superior to others: (*a*) The nonabsorbable sulfonamides in doses of 0.1 to 0.25 gram per kilogram of body weight for 5 days are reasonably effective if it is possible to postpone operation for that length of time. They are also economical and usually readily available; (*b*) our experience, with now well over 100 patients, has demonstrated the superiority of 2 grams of streptomycin and 4 grams of glucurono-lactone daily for this purpose. This combination more effectively reduces the total intestinal bacterial count, does it quicker, maintains suppression for comparatively long periods, and is not handicapped by the development of a drug-resistant flora.

In preparing a patient for elective gastrointestinal surgery, it is essential for the maximal effect of any drug that the tract be cleansed of its contents and maintained that way. This implies catharsis

[12] METZGER, W. I., and SHAPSE, B.: Evaluation of oral aureomycin for intestinal antisepsis. J. Bact. 59: 309–310, Feb. 1950.

and/or enemas until the bowel is emptied and permitting nothing but liquids by mouth in this period of management. This allows for mass reduction in bacterial content and maximal contact between the agent and remaining micro-organisms.

In preparing for an emergency operation in a patient with luminal or vascular obstruction or perforation from any cause such a leisurely approach is not permissible. Decompression is urgently needed to prevent further spread of infection and to combat the associated ileus. Early surgical repair or exteriorization is mandatory, with parenteral antibiotics as one supportative measure. The use of antibiotics by the oral route in these patients or following an elective operation which has become complicated by peritonitis, is ineffectual. Polybacterial peritoneal soilage may be extensive. The immediate establishment of a high antibiotic blood level, and, therefore, peritoneal exudate level, is a surer means of inhibiting further bacterial invasion or multiplication. Scientific proof is lacking in support of the value of sulfonamides or antibiotics placed in the peritoneal cavity. Shock, dehydration, secondary anemia, hypoproteinemia, and electrolyte disturbance receive proper daily attention. The gastrointestinal tract must be placed at rest and so maintained until all points of leakage have sealed, and the peritoneal soilage is being adequately managed by the natural defenses of the body. This is usually signaled by return of peristalsis, normal pulse, reduction of fever, passage of gas or feces voluntarily, and reduced abdominal rigidity and sensitivity. Parenteral antibiotics are continued until these signs are evident for at least 48 hours.

The lethal organisms in peritonitis are gram positive. The antibiotic most effectively employed against these organisms is penicillin, but since it is readily inactivated by penicillinase, which is elaborated by fecal gram-negative organisms, the use of penicillin alone in mixed infections is inadequate. Streptomycin with its known specificity for combating the gram-negative organisms, when parenterally administered with penicillin, may be expected to give adequate coverage in these cases. In severe peritoneal infections, the addition of parenterally administered sulfadiazine may be desirable for synergistic effects.

Recently parenteral aureomycin has been demonstrated to be of real value in combating secondary peritonitis. Wright et al.[13] reporting on aureomycin treatment of a series of 52 consecutive patients with peritonitis secondary to perforated peptic ulcer, appendicitis, and diverticulitis, with a mortality of only 4 percent, concluded that this drug is of significant value. Certainly with increased availability,

[13] WRIGHT, L. T., et al.: Treatment of acute peritonitis with aureomycin. Am. J. Surg. 78: 15–22, July 1949.

aureomycin deserves serious consideration in combating this complication. Further experience is necessary to establish its position in our armamentarium. Aureomycin-glycinate in doses of 500 mg. with 1,000,000 units of penicillin G given intravenously every 12 hours in 1,000 cc. of physiologic saline solution has given gratifying results in fulminating infections in our 6-month test period. The most singly effective agent to date in our hands is terramycin, of which we administer 1 gram intravenously every 12 hours.

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# The Superior Vena Caval Syndrome

## Report of Two Cases

G. Mason Kahn, *Commander, MC, U. S. N.*[1]

In THE past 3 years two cases of the superior vena caval syndrome have been observed by the author. Both of these were a result of new growths and the patients were seen too late for remedial measures to be successful.

Unfortunately facilities were not available to do diodrast studies, and bronchoscopic examinations were not made because the first patient was too seriously ill and the second patient failed to stay in the hospital for this procedure. However, autopsies performed on both patients confirmed the clinical impression of new growths with invasion of the superior vena cava.

In a comprehensive survey of the literature in 1949, McIntire and Sykes[2] studied all cases reported from 1904 up to and including January 1946. They found 250 authentic cases and added 2 more of their own. They stated that Fischer[3] had collected 252 cases of this syndrome prior to 1904.

The incidence, anatomic and physiologic considerations, etiology, symptoms, treatment, prognosis, and historical data are most adequately covered in the articles by McIntire and Sykes and by Hussey et al.[4]

A search of the literature available at this hospital and in this area has failed to reveal any additional published articles dealing with the superior vena caval syndrome between 1946 and May of 1950.

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[1] U. S. Naval Hospital, San Diego, Calif.

[2] McIntire, F. T., and Sykes, E. M., Jr.: Obstruction of superior vena cava; review of literature and report of two personal cases. Ann. Int. Med. 30: 925–960, May 1949.

[3] Fischer, J.: Über Verengerung and Verschlieszung der Vena cava superior. Inaug. Dissert., Halle, 1904. Cited in [2].

[4] Hussey, H. H.; Katz, S.; and Yater, W. M.: Superior vena caval syndrome; report of 35 cases. Am. Heart J. 31: 1–26, Jan. 1946.

## CASE REPORTS

CASE 1. A 67-year-old white man was admitted to the U. S. Naval Hospital, San Diego, Calif., on 11 December 1947 complaining of shortness of breath for 4 years, cough for 2 years, chest pain and orthopnea for 4 months, swollen arms and face for 2 months, enlarged veins of chest and abdomen for 6 weeks, loss of appetite for several months, and hemoptysis for 2 weeks. A review of former admissions revealed (1) that in 1945 he was believed to have cardiac asthma and he had roentgenographic evidence of distinct passive congestion for which he was treated with iodides and sulfonamides; and (2) that in 1946 when roentgenograms of the chest were essentially negative (fig. 1) but he was complaining of shortness of breath and difficulty in breathing when lying down he was believed to have bronchitis and discharged after a short stay in the hospital.

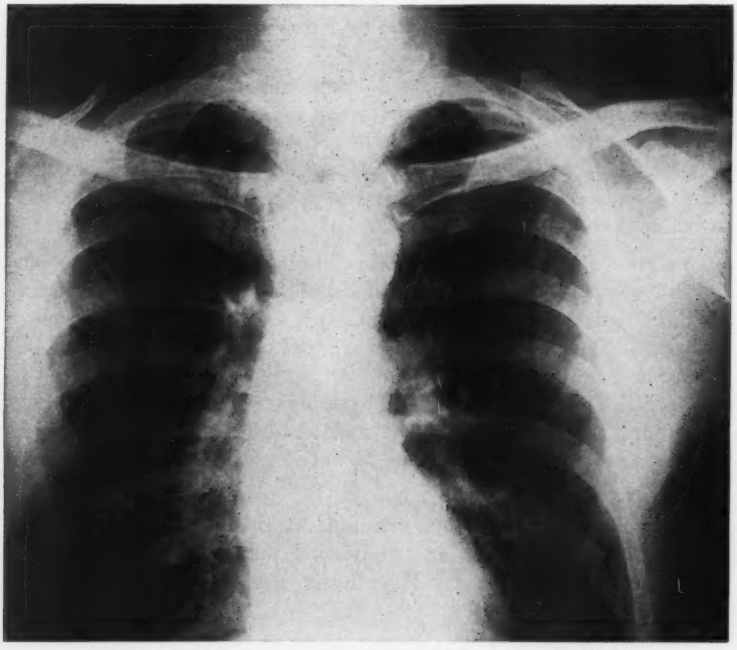

*Figure 1.—Case 1. Roentgenogram taken 15 October 1946.*

The physical examination on this admission revealed an elderly white male with moderate cyanosis who appeared to be in acute distress. He was unable to breathe except when in the upright position. There was minimal cervical and inguinal adenopathy with marked bilateral axillary adenopathy, and an extensive network of distended

veins over the thorax and abdomen; the arms were edematous. There was increased dullness to percussion to the right and left of the sternum, dullness in both bases with a few sibilant rales, and a hard mass was palpable just below the xiphoid cartilage.

*Laboratory data.*—The urinalysis was negative; sedimentation rate, 25 (Cutler); hemogram, normal; blood Kahn test, negative; serum proteins, 6.2 grams with A/G ratio of 1/1. The electrocardiogram was normal. Roentgenograms of the chest (figs. 2 and 3) revealed widening of the upper mediastinum; it was irregular along the right border and there was a moderate amount of fluid in the right pleural cavity and a suggestion of some fluid in the left base. There was moderate aortic calcification.

Indirect laryngoscopy revealed paralysis of the interarytenoid muscle.

*Venous pressures and decholin studies.*—(*a*) Patient was almost upright; (*b*) decholin time, 26 seconds; (*c*) venous pressure, 300 mm. water; (*d*) no essential change in venous pressure on deep inspiration

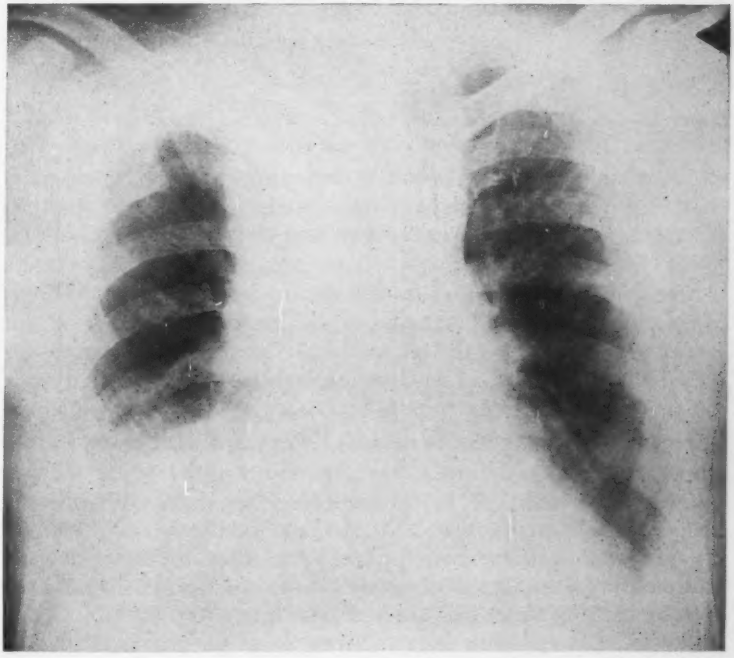

*Figure 2.—Case 1. Roentgenogram taken 20 December 1947, 14 months following the first roentgenogram. This and figure 3 show the widening of the mediastinum.*

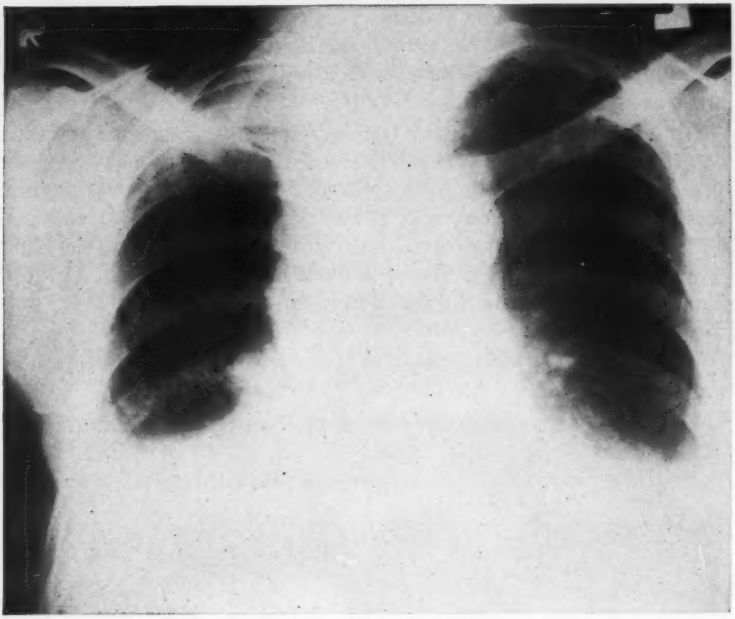

*Figure 3.—Case 1. Roentgenogram taken 19 January 1948 just prior to death.*

and clenching the fist; (*e*) with the venous pressure at 270 mm., water constriction of the lower chest caused a rise to 340 mm. water; and (*f*) femoral venous pressure was 225 mm. water—on deep inspiration the pressure fell considerably.

*Biopsy of left axillary node.*—Specimen consisted of three irregular pieces of fatty and fibrous tissue, the largest of which was 2 cm. in diameter and ½ cm. thick. On section each of these masses contained a streak of firm white tissue. Diagnosis: Hypoplastic lymphoid tissue with fat replacement.

Bronchoscopy was unobtainable. The patient died 6 weeks after admission.

*Postmortem findings:* (*a*) Bronchiogenic carcinoma, undifferentiated type, right main bronchus, 1 cm. distal to bifurcation of trachea; (*b*) metastatic bronchiogenic carcinoma to hilar nodes, right upper and middle lobes lung, visceral peritoneum (colon and ileum); (*c*) occlusion (thrombotic) and pressure from tumor in right hilum, superior vena cava and both jugular veins, 2 cm. peripheral from right auricle; (*d*) hydrothorax, 1,500 cc. in the right pleural cavity and 1,000 cc. in the left pleural cavity; (*e*) pleuritis, fibrous, ancient, right;

(*f*) atelectasis, pulmonary, massive, right middle and lower lobes, left lower lobe, partial left upper lobe; (*g*) arteriosclerosis, grade 2 (including the coronary arteries) with aortic sclerosis, grade 3; and (*h*) epithelial inclusion cyst (below xiphoid process).

CASE 2. A 55-year-old male Veterans' Administration patient was admitted to the U. S. Naval Hospital, San Diego, Calif., on 9 September 1949 complaining of pain in the chest and shoulders, swelling of his feet and ankles, cough and shortness of breath, aching in the legs and feet, back pain, and hemorrhoids. He stated that he had an attack of pain in his chest and shoulders about 2 years previously and again 1 year prior to admission. These attacks consisted of gas pains across the chest radiating to the shoulders and down both arms, with some shortness of breath and severe orthopnea. The swelling of the feet and ankles and the pain in his legs had been present only with the current attack. In addition he had pain in a small localized area of the back above the sacrum. He occasionally had cold sweats with the attacks. He stated that he had had chronic bronchitis for several years with cough at night productive of white foamy sputum, had noted dark and bright red blood in the stools, and had taken cathartics for constipation for the previous 20 years.

He had been treated with penicillin 1 year previously for bronchitis and stated that he had had considerable improvement.

The past and family histories were noncontributory.

The physical examination revealed a middle-aged white man who did not appear to be acutely ill. The blood pressure was 100/70, there was a small area of tenderness over the fourth lumbar vertebra, and there were many large external and internal hemorrhoids. There was 1 plus pitting edema of both ankles.

*Laboratory data.*—The urinalysis was negative; hemogram normal; blood Kahn test negative; histoplasmin, coccidioidin, and tuberculin skin tests were negative; repeated specimens of sputum were negative for acid-fast bacilli; alkaline phosphatase, 4.6 Bodansky units; acid phosphatase, 1.56 Bodansky units; blood chlorides, 455 milligrams per 100 cc.; blood urea nitrogen, 15.2 milligrams per 100 cc.; serum proteins, 5.6 grams with A/G ratio of 1.66/1; and febrile disease agglutination tests, negative. Decholin circulation time, 15 seconds; venous pressure in upper extremity, 170 mm. water; repeated electrocardiograms revealed patterns of established anterior and posterior myocardial infarctions.

Roentgenograms of the chest (figs. 4 and 5) revealed a prominence of the right hilar shadow with an infiltration extending upward from

this area into the right apex and a slight increase in the bronchovascular markings radiating downward from this region.

The vital capacity was 3.21 against a normal of 4.90 liters. Specimens of sputum stained by Papanicolaou technic were negative for malignant cells. Gastrointestinal barium study was negative. Laryngoscopic examination was negative. Barium enema was negative. Fluoroscopic examination of the chest revealed both diaphragms to

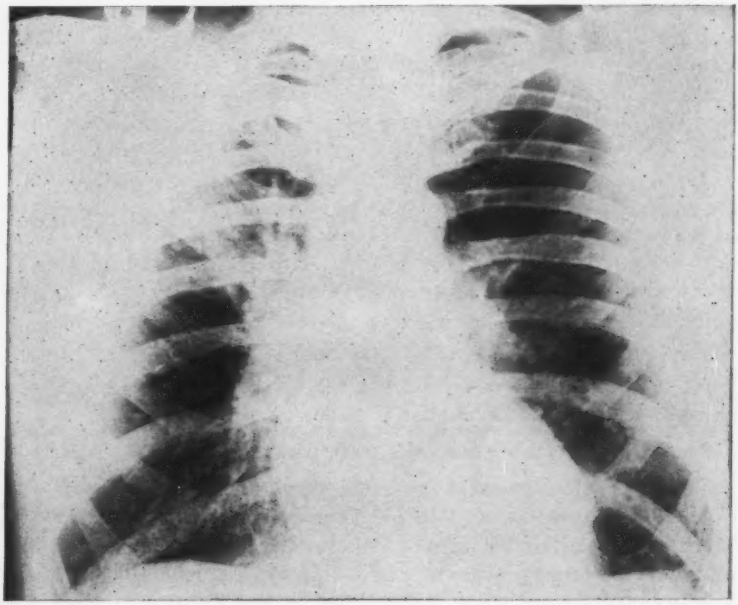

*Figure 4.—Case 2. First roentgenogram of chest taken 19 September 1949 revealing the infiltration extending up into the right apex.*

move freely. The electroencephalogram was normal. An infra-red photograph of the chest (fig. 6) showed dilated veins in the upper chest. Cystoscopic and retrograde urinary tract studies were negative.

A roentgenogram of the chest taken 5 weeks after the first one revealed a slight increase in the infiltration in the upper right lung field and it was noted that there was a small patch at the periphery of the left lung opposite the second interspace anteriorly.

The patient was digitalized and preparations were made to perform a bronchoscopy, however he insisted on leaving the hospital against medical advice. At the time of discharge the pulse was 84, the chest was hyperresonant with coarse moist rales in the right base, the liver was 3 fingerbreadths below the costal margin, there was

clubbing of the fingers, and 4 plus pitting edema of the legs up to the knees.

Approximately 4 weeks after discharge he was readmitted complaining of shortness of breath and edema of the upper extremities. The physical examination revealed an acutely ill white male who was extremely dyspneic and cyanotic. The blood pressure was 100/60, the heart was enlarged to percussion 2 cm. outside the midclavicular

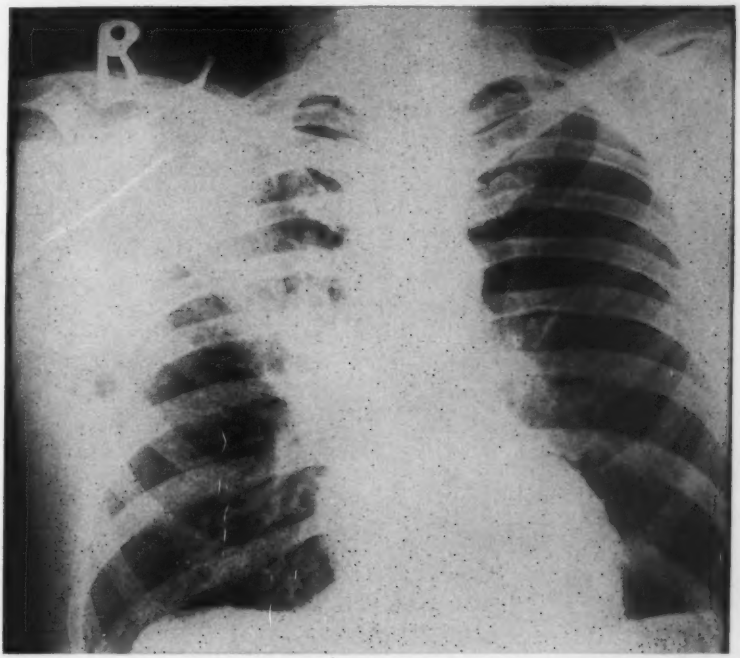


*Figure 5.—Case 2. Roentgenogram taken 10 October 1949, 21 days after figure 4, showing increase in density extending into right apex.*

line in the fifth interspace, there was marked dullness with decreased breath sounds and vocal fremitus over the lower one-third of the right lung, the liver was palpable 2 fingerbreadths below the costal margin, there was slight nonpitting edema of both legs, and 3 plus pitting edema of both upper extremities. A roentgenogram taken just prior to death showed the right pleural cavity almost completely filled with fluid. Despite all supportive measures he died 24 hours after admission.

*Postmortem findings.*—There was replacement of the intercostal muscle in the fifth intercostal space by necrotic pink tumor with ero-

*Figure 6.—Case 2. Infra-red photograph showing the dilated veins of the upper chest.*

sion of the adjacent rib margins. The tumor was continuous with the right upper lobe (of the lung) which was firm. The mediastinum was filled with white tumor tissue which displaced the lower third of the esophagus to the left and was continuous with the right lung and bron-

chus. There were several nodules up to 3 cm. in diameter on the left side of the trachea. There was 500 cc. of serosanguineous fluid in the right pleural cavity. The left lung was completely expanded with numerous pleural adhesions. The transverse pericardial diameter was 14 cm. It was adherent over most of the epicardial surface by fibrous adhesions and the remaining surface was pink and granular. At the base, the pericardium was invaded by tumor which occluded the superior vena cava 4 cm. superior to the right auricle by external pressure and extended into the myocardium partially surrounding the aortic valve and involving the right auricle and septum.

The heart measured 13 by 10 by 5 cm. The surface was covered by ragged fibrous adhesions and granular epicardium and on the anterior surface of the left ventricle near the apex the myocardium was replaced by a fibrous scar 4 by 2 cm. which was 2 mm. thick. There was fibrous streaking of the myocardium in the interventricular septum and white tumor tissue in the myocardium of the interauricular septum, right auricle, and partially surrounding the aortic valve. The valves were intact. The openings of the coronary arteries were patent, and the arteries showed 4 plus sclerosis with calcification and old occlusion of the anterior descending branch, left coronary artery.

The right lung measured 24 by 11 by 11 cm. The surface was a mottled dark blue color with a pink necrotic tumor over the superior lateral surface. The right main and lower lobe bronchi were filled with a plug of gray and pink tissue which was not adherent to the mucosal surface. The inferior medial surface of the right main bronchus, 2 cm. distal to the bifurcation, showed a white verrucose elevation which was continuous with the tumor extending into the mediastinum filling the secondary bronchi and replacing lung parenchyma of the upper lobe and medial portion of the middle lobe. On section the tumor was white and gray with scattered soft areas of necrosis. In the lower lobe and lung parenchyma of the middle lobe were multiple tumor nodules up to 1.5 cm. in diameter.

The left lung measured 24 by 15 by 15 cm. The surface was dark blue and covered with ragged fibrous adhesions. Section revealed dependent congestion, a tumor nodule 2 cm. in diameter in the lower lobe and multiple nodules up to 0.5 cm. in diameter throughout the upper lobe. The trachea and left bronchus appeared normal.

The right adrenal gland was replaced by a mass of soft pink-gray tumor, 5 by 4 by 3 cm., in which small areas of orange cortical adrenal tissue could be identified. The left adrenal was of normal size and section revealed three nodules of white tumor tissue within the medulla.

On microscopic examination, sections of the myocardium revealed areas of diffuse fibrosis. The myocardium from the left ventricle near

the apex showed only a narrow zone of muscle fibers—the remaining wall being made up of dense fibrous tissue. A section from the right auricle showed atrophic myocardium, a dense pericardial stroma and tumor which consisted of sheets of round and polygonal cells which varied markedly in size and had multilobed vesicular nuclei or multinuclear forms with occasional mitoses. There was scanty fibrous stroma within the tumor.

A section from the right main bronchus showed tumor tissue completely surrounding the bronchial cartilage. This was similar to that already described. Other sections of lung showed edema. The alveoli were filled with large macrophages in some areas, and masses of tumor cells in others. The tumor in these areas consisted of sheets of elongated cells having uniform oval vesicular nuclei with occasional cells showing keratinization, indicating this to be an epidermoid carcinoma.

Sections of the liver revealed numerous areas of fatty degeneration and chronic passive congestion.

Sections from the adrenals showed masses of tumor tissue which were largely necrotic. There was pressure atrophy of the adrenal cortical tissue remaining.

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ADDENDUM.—Since this article was completed MacGregor and Stoolfire published an article in the U. S. Armed Forces Medical Journal of June 1950 in which they reported two additional cases of the superior vena caval syndrome. In one the cause was believed to be due to a thrombus of the superior vena cava, and in the other autopsy findings were those of a squamous cell carcinoma of the mediastinum, probably bronchogenic.

# Planning and Designing Removable Partial Dentures

ARTHUR H. SCHMIDT, *Lieutenant Colonel, U. S. A. F. R. (DC)*

THE field of removable partial denture construction presents numerous problems that have challenged the ingenuity of some of the finest minds in dentistry. Many outstanding men have contributed to progress in this field. On the whole, this progress has been empiric rather than scientific. Removable partial denture construction does not readily lend itself to scientific methods of study because of (*a*) the infinite variety of patients; (*b*) their different states of health; (*c*) the multitudinous methods of treatment and construction available; and (*d*) the length of time needed, usually years of periodic observation, before scientific conclusions can be drawn. Likewise, there remains the difficulty, if not impossibility, of obtaining an adequate number of control patients to check the results of one method of treatment against those of other methods. Although some scientific work has been done on removable partial dentures, this has been the exception. When success is measured by the ability to make restorations that function over a period of 10 or more years, without damage to the remaining teeth and their investing tissues, it must be clear that this work is based on practical rather than truly scientific methods.

This explains why, with few exceptions, improvement has come about through trial and error. Although it is impossible to standardize procedures in a manner to fit all modifications, certain principles of design are fundamental. If removable partial dentures are to become a part of dental health service, much of the confusion now existing must be resolved. The student, undergraduate or graduate, is bewildered by the multiplicity of attachments, clasps, stress breakers, tooth types, and the large number of technical procedures, all of which are claimed by their sponsors to be panaceas for some specific type of condition. As a result of this situation most dentists are accepting the removable partial denture as a short intermediate step to full dentures and are delegating the greater part of the problem to the commercial laboratory. These laboratories at best can only provide a solution to

part of the engineering side of the problem. All too frequently the appliances designed and made by laboratories are more harmful to the patient than the conditions they are supposed to correct. The laboratory technician's responsibility begins and ends with fitting a denture to a master cast made from an impression taken by a dentist and articulating the denture according to an occlusal registration furnished by the dentist. This limited responsibility does not mean that the laboratory technician should have no concern for the interests of his clients. On the contrary, he should learn the biologic factors involved in restorative dentistry.

Many of us interested in the teaching of removable partial denture prosthesis to undergraduates have felt the need of a better understanding of the principles involved. Recognizing the impossibility of giving students a solution for each problem that may arise, we have been forced to stress basic principles, which, if applied with judgment based on clinical experience, could aid the student in solving most of the problems commonly encountered. It is a human failing to pass lightly over abstract principles and to stress concrete details. The basic principles of removable partial denture prosthesis are:[1]

1. Dentists must have a working knowledge of both the mechanical and the biologic factors involved in removable partial denture design and construction.
2. Any plan of restoration must be based on a complete examination and diagnosis of the individual case.
3. The dentist, not the technician, should correlate the pertinent factors and recommend a proper plan of treatment.
4. A removable partial denture should restore form and function without injury to tissue.
5. A removable partial denture is a form of treatment, not a cure.

## PRINCIPLE 1

In order that he may render adequate removable partial denture service, the dentist must have a knowledge of anatomy, histology, pathology, physiology, and biochemistry as well as a working knowledge of many of the laws of physics and engineering, particularly those that apply to levers. He must be familiar with dental materials. He should keep abreast of scientific advances in both biologic and mechanical aspects of dentistry. The tradesman serves his time as an apprentice and spends the rest of his life performing that which he has learned. The professional man in his college years receives a foundation and the privilege and opportunity to continue to learn.

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[1] The author expresses appreciation to George A. Hughes, D. D. S., for the basic principles of removable partial denture prosthesis.

Because the student, alone, cannot gain the experience that is possible through a constant interchange of ideas in a large group, study clubs and professional societies are necessary. More dentists should ally themselves with these groups rather than practice dentistry as though it were a trade.

### PRINCIPLE 2

A complete examination and diagnosis must be made before a removable partial denture can be designed. It is not sufficient merely to look into a patient's mouth and see that there are missing teeth. An appliance which may render good service for one patient might be contraindicated for another, even though at first glance the two may seem to be similar. An examination for a prosthesis must be more comprehensive than that which is generally undertaken. We should know as much as possible about the mouth of the patient, and in most cases we should also know something of his general health, his bone structure, and his eating and hygienic habits. An examination with roentgenograms is necessary for even the most simple removable partial denture. Study models, either mounted or unmounted, are desirable except in the simplest cases. Many dentists may think that the time spent making such an examination is largely wasted but such a belief is short-sighted and poor economy. One failure caused by an improper plan of treatment based on an inadequate examination and diagnosis wastes more time than would be used in many hours of consultation and examination.

### PRINCIPLE 3

The dentist should plan the treatment of these patients himself. The technician's function is to make raw materials into a finished removable partial denture. Although in this phase of the work he frequently becomes more skilled than the dentist because of constant technical practice, the fabrication of the appliance is but one phase of the problem. The treatment of a patient requires more than a knowledge of mechanical factors and technical ability. It is frequently necessary for the dentist to institute preparatory or corrective procedures prior to the construction of a restorative appliance. Contours of teeth may require modification, occlusal relations may require improvements or surgical procedures may be necessary. The patient will accept such corrective procedures with much better grace if he is informed of the necessity of an adequate examination and diagnosis prior to the construction of an appliance. As the dentist alone may modify the conditions present in the mouth in order to influence the outcome, he, not the technician, should plan the treatment.

PRINCIPLE 4

A removable partial denture should not injure remaining teeth or adjacent structures. It is essential to plan or design the restoration in accordance with biologic laws governing the reactions of tissue. Sound principles of mechanics must also be followed in order that the appliance will function without undue alteration. The appliance must be carefully made so that it will go into its place without modification of the adjacent structures. The casts used in making removable partial dentures must be made from impressions which faithfully record the shape of the oral tissues.

The functions of a removable partial denture are: (*a*) the restoration and preservation of occlusion impaired by loss of teeth; (*b*) the restoration and preservation of occlusion impaired by malposition of remaining teeth; (*c*) the preservation of the remaining teeth and alveolar ridges; and (*d*) the restoration of a normal or desirable facial expression impaired by loss of teeth or closure of the bite. A removable partial denture must be planned and constructed to fulfill these essential purposes with a minimum of interference with the tongue or enunciation and the least possible display of structural materials. The various parts of the base must be designed to provide an adequate mechanical counterbalance or resistance to the differently directed forces or movements without interfering with any of the functions of a removable partial denture.

Saddles are supporting elements, one of their functions being to resist vertical masticatory pressure against the alveolar ridges. These flanges, resting against the lingual or labial sides of alveolar ridges, may provide bracing support against horizontal, lateral, or anteroposterior displacements. The stress of mastication must be resisted by an adequate support. When possible, toothborne support should be used, otherwise the size of the saddle must be increased in proportion to the stress exerted on it. When the size of the saddle cannot be increased sufficiently, the occlusal stress must be reduced in order that a satisfactory relation between pressure exerted and ability to resist such pressure is attained.

Removable partial dentures which depend on mucosa for support must not transmit this stress other than in a rootwise vertical direction to the abutment teeth. When the denture is displaced because of compression forces occasioned by the stress of mastication, torquing strain must not be transmitted into the abutment teeth. These strains and stresses must either be minimized or eliminated by proper design of the retainer or some sort of stress-breaking action must be provided. Clasps are direct retainers whose function is to prevent the vertical dislodgment of the denture from its seat. Clasps may also serve as

bracing supports to prevent the horizontal shifting of the denture or drifting or rotation of the teeth engaged by them. Direct retention by clasps is provided only for the ends of the saddles to which they are attached. When no anchor teeth are available at the other end, some means must be found to hold the saddles in their position against the ridges. This can be accomplished by extensions of the base to rest against the surfaces of teeth on the opposite side of an axial line between the clasps. Such parts of a denture are known as indirect retainers.

Indirect retention as well as direct retention should be provided in all patients with distal extension in order to stabilize the appliance. Major connectors, such as palatal, lingual, or labial bars, serve the purpose of joining posterior saddles with each other, or in unilateral cases connecting the posterior saddle with an anchorage on the side of the arch opposite the saddle. Among these connecting elements must be included all the smaller bars and struts that are employed to join nearby saddles, or to support or reinforce clasps or indirect retainers. Lingual and palatal bars should be so located that they will neither interfere with the comfort nor the speech of the patient. The palatal bar should be located in about the same position as the distal border of a complete denture, crossing the palate distal to the second molars.

Independent lateral action of saddles should be prevented. The use of too light a lingual or palatal bar allows an independent action of saddles, rotating about the ridge crest as a center. The stress of mastication in causing this rotation places great pressure on the buccal and lingual peripheries of the saddle. Soreness in these areas may result and the dentist frequently is forced to trim away the saddle thus reducing the much needed support. Bars joining saddles, and lingual bars in particular, must be of sufficient strength to prevent torsion of saddles. Stabilization is not merely a matter of vertical support and vertical retention. It is a problem of anchoring a denture to prevent displacement from its functional position by forces that act on it horizontally as well as vertically.

Tooth rests, sometimes called "stops" or "rest lugs," are intended to resist the movement of a denture by vertical masticatory pressure. In addition to vertical support of the denture in its functional position, they also (*a*) are an important aid to the retentive capacity of clasps, by helping to keep the clasp terminals in their proper positions; (*b*) prevent impingement of the cervical edges of clasps against the gingival margins of anchor teeth; and (*c*) prevent the impingement of the extremities of saddles against tissues adjacent to the gingival margins.

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Each tooth adjacent to an edentulous area should carry a tooth rest, whether it is clasped or not. As direct retainers, clasps secure against vertical displacement those parts of dentures to which they are directly attached, and depend for their effectiveness on (*a*) the contours of the crowns of the anchor teeth, or the angles at which they lean toward or away from each other, and (*b*) the physical properties of the clasp metal. In order to provide retention, one or both of the terminals or arms of a clasp must be elastic enough to spread open and pass the opposing projections created by the contours of the anchor teeth and then close about the undercut. This spreading is greatest at the free ends or terminals and gradually diminishes to nothing where the clasp is joined to the base of the denture. To locate these undercuts and determine the most favorable areas for retention, the master cast should be surveyed. Clasp guide lines should be charted with a surveying instrument. The guide line defines the limits of projection on the contour of the proposed anchor teeth and indicates the position of retention undercuts. The position of the guide line and, therefore, of the clasps can be changed by varying the angle at which the cast is tilted. The angle of the cast determines the path of insertion of the denture to make it easy to seat and remove from the mouth, in a direction parallel to the vertical mandrel of the surveyor.

### PRINCIPLE 5

A removable partial denture is a form of treatment rather than a cure. As with any other treatment, it should be planned in accordance with the conditions of the particular case; it should be individualized and must be modified from time to time in order to suit changing conditions. The denture itself is subject to wear and breakage. The oral tissues never remain the same but are constantly changing, hence the patient must be periodically recalled in order to prevent or rectify deleterious changes that may take place. In the construction of a removable partial denture, simplicity should be a byword. The simpler the appliance, the less need for adjustments and repair. The appliance should be so designed and constructed that it may be modified to compensate for changes in the thickness of mucosa or alveolar resorption.

### CONCLUSIONS

The planning and designing of a removable partial denture is a responsibility of the dentist and should not be delegated to any other person. The dentist engaged in making such restorations must have a knowledge of the biologic and mechanical factors involved and he must continuously augment this knowledge. This type of prosthesis is treatment and should be planned in accordance with the conditions peculiar to the patient. This requires more than a knowledge of

mechanical factors and technical ability. Plan, design, and then construct to obtain the best results. The principles of surveying, the significance of the guide line, its relation to the clasp, and the opportunity presented by tilting the model to control the location of undercuts are basic factors that enable the dentist to solve any problem in this field.

# Breast Feeding[1]

HOWARD J. MORRISON, *Commander, MC, U. S. N. R.*[2]

BREAST feeding is a physiologic function which, in spite of occasional abuse from disuse, has persisted throughout the ages. It seems incredible for a physician, especially a pediatrician, to be defending breast feeding. That the need for such defense exists is shown by the fact that there is a decrease in the number of infants who are breast fed [3] or who even have a fair chance of obtaining this most perfect food of early infancy. The lack of success in breast feeding can be partially attributed to the medical profession whose responsibility it is to familiarize the public with the fact that any artificial feeding is at best only a substitute for human milk. In our daily work, we are forever devising formulas to simulate breast milk more closely.

The mother animal has given her milk to her offspring as its first food since the beginning of mammalian development. This is just as true of the human being as it is of the lower forms of animal life. The milk of every mammal is specific for its young and the human being is no exception. Nonspecific milk may be not only imperfectly adapted to the offspring of other animals but actually harmful. Even specific milk, as the complete source of food, is only adequate for a short period of time.

The ease and safety of artificial feeding has decreased the fear in the mother unable to nurse her infant. It is quite probable that because of safer artificial feeding, there is less stimulus for the mother to breast feed her infant.

Certainly, the advent of pasteurization and other forms of clean milk (evaporated and powdered) has made artificial feeding safer for the infant deprived of its birthright, breast milk. In areas of the world such as China, Japan, and the Philippine Islands, where safe milk is not available and diarrheal diseases are prevalent, the incidence of

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[1] Read at the Clinical Session of the American Medical Association on 8 December 1949 in Washington, D. C.

[2] Inactive.

[3] BAIN, K.: The incidence of breast feeding in hospitals in the United States. Pediatrics 2: 313–320, Sept. 1948.

human breast feeding remains very high, close to 100 percent. These mothers nurse because they know the infant deprived of human milk during the first year has a poorer chance of survival.

1. Human breast milk feeding:

(*a*) Clean source.
(*b*) Adequacy (C-P-F-minerals, vitamins, and so forth).
(*c*) Digestibility.
(*d*) Colostrum (its value in relationship to immunity transmitted).
(*e*) Emotional (mother-infant relationship).
(*f*) Contraindications.

There is no question of the clean source. It has been stated repeatedly that human breast milk is kept at the correct temperature, stored in a readily available place, and for all practical purposes is free of harmful bacteria.

We know of the adequacy of breast milk as to the content of carbohydrate, protein, fat, minerals, and vitamins. These percentages are quite constant in breast milk with the exception of fat. The carbohydrate is lactose 7 percent, protein 1–1.5 percent, fat about 4 percent but may vary from 2 to 10 percent, minerals 0.25 percent, and water the remaining 87 percent plus. Fifty years ago, the human milk was described in less than a dozen components. Macy [4] recently reported the results from analyses of samples of breast milk for each of 73 components in colostrum, transitional milk, and mature milk. This additional information emphasizes the adequacy of breast milk.

Recent studies indicate that premature infants have a low tolerance for fat and thrive better on a low fat feeding.[5 6] The fat content is very low in colostrum, increases in the transitional human milk during the first month, and often does not reach its highest level in mature milk until 30 or more days after birth. The first part of breast milk obtained by premature and small infants, who do not suck vigorously, has a low fat content. As a result, they do not obtain the high fat content of the strippings or last part of milk. Thus nature has provided adequate milk for the premature as well as the full-term newborn infant. It is wise, however, to give a premature infant the breast milk pumped from its own mother. In this way, the fat content will be increased gradually, thus offering the best chance of tolerance.

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[4] MACY, I. G.: Composition of human colostrum and milk. Am. J. Dis. Child. 78: 589–603, Oct. 1949.

[5] GORDON, H. H.: Feeding of premature infants. Am. J. Dis. Child. 73: 713–718, June 1947.

[6] GORDON, H. H., and LEVINE, S. Z.: Metabolic basis for individualized feeding of infants; premature and full-term. J. Pediat. 25: 464–475, Dec. 1944.

Infantile eczema has been shown to occur less frequently in the breast-fed infant.[7] The incidence is doubled in the partially breast fed and increases seven times in the entirely artificially fed infant. Breast milk appears to be a great factor in the prevention of allergy in infants and children. Morbidity and mortality rates are lower in the breast-fed than in the artificially fed infants.[8] This is most striking in the lower incidence of respiratory infections occurring during the second half of the first year of life.[9] Gastrointestinal infections are also less frequent in the breast-fed infant.[10] Breast milk appears adequate in the prevention of illnesses as well as from the nutritional standpoint.[11] [12]

Breast milk is easily digested by the newborn infant. It remains nearly liquid in the stomach and forms curds which are soft, finely flocculent, and permeable to digestive juices.

Colostrum is present in the mother's breast during the latter months of pregnancy and the first 3 or 4 days following delivery. It is much thicker than later breast milk, lemon yellow in color, and has a specific gravity between 1.050 and 1.060 in contrast to a specific gravity of around 1.030 in breast milk. Several ounces of colostrum are obtained daily by the nursing infant. Colostrum varies widely in composition but in general has about five or six times as much protein, twice as much mineral salts, and about half as much fat and carbohydrate as later milk. It has a high sodium and phosphorus content. In contrast to breast milk, colostrum coagulates on boiling. Colostrum has the important function of being a laxative and for this reason may be of importance in ridding the intestinal tract of meconium. Animal experimentation has led to the theory that colostrum may be of significance in the development of immunity in the infant.[13]

The emotional factor is important. The mother-infant relationship cannot be stressed too strongly. After the birth of a newborn

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[7] GRULEE, C. G., and SANFORD, H. N.: Influence of breast and artificial feeding on infantile eczema. J. Pediat. 9: 223–225, Aug. 1936.

[8] GRULEE, C. G.; SANFORD, H. N.; and HERRON, P. H.: Breast and artificial feeding; influence on morbidity and mortality on 20,000 infants. J. A. M. A. 103: 735–739, Sept. 8, 1934.

[9] STEVENSON, S. S.: Adequacy of artificial feeding in infancy. J. Pediat. 31: 616–630, Dec. 1947.

[10] EBBS, J. H., and MULLIGAN, F.: Incidence and mortality of breast and artificially fed infants admitted to hospital with infections. Arch. Dis. Childhood 17: 217–219, Dec. 1942.

[11] POTTER, E. L.: Lessons to be learned from study of infant deaths. J. A. M. A. 124: 336–339, Feb. 5, 1944.

[12] ALDRICH, C. A.: Advisability of breast feeding; survey of Subcommittee of Committee on Maternal and Child Feeding. National Research Council. J. A. M. A. 135: 915–916, Dec. 6, 1947.

[13] BRENNEMANN, J.: Practice of Pediatrics, vol. 1. W. F. Prior Co., Hagerstown, Md., 1948. Chapter 25, pp. 1–4.

infant, its closest contact with the mother comes during the period when it is being nursed. At birth the infant has to maintain its body temperature, initiate respiration, and take on many functions which before were carried on for it by the mother. By nursing the infant, the mother continues to be the source of supply. The only difference is that the nourishment is now obtained through his gastrointestinal tract whereas prior to birth he was nourished through the maternal blood supply. The physical act of nursing is an excellent opportunity for the mother to give the newborn infant security. It should be a time of happiness for both mother and infant. The mother should derive great satisfaction from the giving of herself to her infant and show love and affection during the act of nursing. How often we notice this in the gentle stroking of the infant's face, body, or hands by the mother during the nursing act. The separation of the infant from the mother should be a gradual process.

Contraindications of breast feeding:

(*a*) Complete absence of milk (a very rare condition).

(*b*) Maternal whooping cough at the time of delivery.

(*c*) Open active maternal tuberculosis.

(*d*) Intractable inverted nipples that render nursing impossible.

(*e*) Painful nursing that the mother cannot bear.

(*f*) Emotionally immature mother who abhors any physical contact with the baby's lips to her breast and speaks of the nursing act as being repulsive. Of course, this is evidence of rejection of the baby before or at birth. These infants must be artificially fed in order to give them the best possible chance to obtain security through the gratification of their appetite and to be nourished. They rarely derive this security or gratification from attempting to nurse such a mother unless such a mother is shown the light, so to speak, and enters into the nursing act wholeheartedly. If and when such a mother cannot be persuaded to nurse the infant for the security that she will transmit to her offspring, as well as for the nourishment obtained, it is quite likely that she will shirk other responsibilities of a mother. The chances are great for such an infant to develop symptoms of insecurity from rejection. Later these infants are prone to develop nightmares, speech defects, enuresis, thumb and finger sucking habits from their lack of security obtained from the mother. These conditions are far more serious than the nutritional loss from not receiving their mother's milk.

Rh negative mothers who possess anti Rh agglutinins in their blood also have these agglutinins in their breast milk.[12] This was at one time

considered a contraindication to breast feeding until Cathie [14] demonstrated no effect (anemia, jaundice, or edema) when breast milk containing anti Rh agglutinins or high titer human serum was fed Rh positive infants. Breast feeding of erythroblastotic infants is practiced routinely at the hospital for sick children. Rh incompatability is not considered a contraindication to breast feeding.

An opportunity to institute breast feeding in a large number of newborns presented itself to me in 1943 at the United States Naval Dispensary in Washington, D. C. Because of frequent changes in medical personnel, the babies delivered by the obstetrical staff were not examined by pediatricians, and the mothers were given formulas by the interns or nurses at their time of dismissal from the various hospitals. As a result, practically every infant brought to the dispensary at from 4 to 6 weeks of age was artificially fed.

Close cooperation between the obstetrical and pediatric departments resulted in the formulation of plans whereby the newborn infants were turned over to the pediatric service at birth. These newborn infants were examined usually within the first 24 hours. They were put to breast at the first regular feeding time after they were 12 hours old and allowed to nurse for 5 minutes at each breast 3 three times a day until the third day when a 4-hour nursing schedule was instituted day and night, the infant being allowed to nurse one breast at a feeding as long as it desired. Five percent glucose water was offered every 4 hours until lactation was established, then boiled water was offered after breast feedings. If an infant took more than an ounce of water after each feeding, a complementary formula was offered.

Every mother was visited after the examination of her infant and told of its state of health. She was asked to try to breast feed her baby, being assured that a formula would be given her upon dismissal from the hospital which she could use if it became necessary. Each mother was asked to continue breast feeding for the first month, even though a complementary feeding was necessary to satisfy the infant's appetite. Mothers were told that the infant's best first food was breast milk and that other foods, as well as milk other than breast milk, would be given to her baby at a later date as the infant showed the need.

Future nutritional requirements of the infant and mother were anticipated both while in the hospital and at later visits to the dispensary. The mothers were acquainted with the fact that one could not rely upon breast feeding alone beyond the fourth month and that continuing breast feeding beyond the seventh month was probably not

[14] CATHIE, I. A. B.: Breast-feeding in erythroblastosis fetalis. Brit. M. J. 2: 650, Oct. 25, 1947.

necessary. They were also assured that one bottle could be given daily at anytime after the infant was 2 months of age to replace a breast feeding. They were instructed to allow the infant to nurse both breasts the feeding before and the feeding after the artificial feeding. It was believed that by such explanation, breast milk was being put into the proper perspective; being neither over- nor under-emphasized.

We were quickly confronted with the scourge of maternal nipples with fissures, which were painful and often bled. This practically always occurred in mothers with inverted or tender nipples. Warm boric acid compresses and nupercaine ointment usually relieved this condition. The real problem was prevention and after consultation with members of the obstetrical department, a plan was worked out for the mother to spend a short time daily after the fifth month of pregnancy on the care of her nipples. Briefly, this consisted of pulling inverted nipples out from the breast with the thumb and first two fingers, at the same time massaging with cocoa butter and cold cream, and later with a soft towel or soft bristle brush. Witch hazel or 70 percent alcohol was suggested to toughen tender nipples. During the last month a stiff bristle brush was suggested. We were amazed at the decreased incidence of fissured nipples when these instructions were followed.

The idea of breast feeding spread quickly to the prospective mothers, and the percentage of breast-fed infants rapidly increased. Much of the credit resulted from the excellent cooperation of the obstetrical staff of the Naval Dispensary and of the nurses in Georgetown, Columbia, and Providence Hospitals where the majority of the deliveries took place. We heard that breast feeding helped the uterus to return more quickly to its normal size and position, that postpartum hemorrhage occurred less frequently, and so forth. The most obvious difference occurred in the closer maternal-infant relationship. Mothers nursed their second, third, and fourth infants when previous attempts had been unsuccessful. One mother who successfully nursed her fourth offspring volunteered the information that it was the first time she had been given a fair chance to breast feed, and that with her first two deliveries, her babies were brought to her with a bottle containing a formula which was said to agree with the infant.

In another instance, a 44-year-old primipara delivered by cesarean section, left Columbia Hospital at the end of 10 days, nursing her infant; but the infant was taking 4 ounces of a formula after each breast feeding. When she came to the dispensary 1 month after delivery, her infant was entirely breast fed and had refused additional milk feedings after the twentieth day. The gain was very satisfactory. Vigorous nursing by the infant was reported on the fifteenth day.

This mother stated that her breasts gradually became more firm upon leaving the hospital but around the sixteenth day there was a sudden increase in her milk, and her baby took less than 1 ounce of milk or water after breast feedings. Establishment of successful breast feeding during the third postpartum week on a self-regulating feeding program has been reported.[15] I have observed it repeatedly in private practice. The mother stated that her milk came in on a given day during the third week just as full lactation usually occurs on the third, fourth, or fifth day. This is another piece of propaganda to encourage mothers to attempt breast feeding for the first month.

One thousand two hundred and sixty-six infants were followed in the dispensary. At 6 weeks of age, 693 (54.74 percent) were entirely breast fed, 260 (20.54 percent) were partially breast fed, and 313 (24.72 percent) were completely artificially fed. This average could be duplicated or increased in any clinic where attempts are made to stimulate breast feeding.

Off-hand, one may not think this incidence of breast feeding to be very high. Under the conditions of having to establish a rigid hospital schedule, it is probably far above average. One can easily understand that a much higher incidence of breast feeding would result under ideal conditions of a self-demand schedule.[16-19]

Statistics on the number and percentage of infants breast fed at 3, 5, and 7 months were not compiled because so many mothers left to follow their husbands who were being transferred to a port for foreign duty.

Of the infants entirely breast fed for the first 6 weeks who returned for subsequent visits, we noted the vast majority continued successful breast feeding for the first 5 months. The weaning of infants after 6 weeks of breast feeding was because of breast infections or for reasons other than lack of supply of breast milk. The most frequent reason given for weaning after successful breast feeding during the first 6 weeks was the mother going to work or following her husband.

We did notice the almost complete absence of artificial feedings disagreeing with the infants breast fed during the first 6 weeks of life.

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[15] SIMSARIAN, F. P., and MIALE, F.: A case history of breast feeding successfully established during the third postpartum week on a self-regulating feeding program. J. Pediat. **33**: 295–299, Sept. 1948.

[16] SIMSARIAN, F. P., and MCLENDON, P. A.: Feeding behavior of infant during first 12 weeks of life on a self-demand schedule; narrative by mother with discussion by pediatrician. J. Pediat. **20**: 93–103, Jan. 1942.

[17] TRAINHAM, G., and MONTGOMERY, J. C.: Self-demand feeding for babies. Am. J. Nursing **46**: 767–770, Nov. 1946.

[18] EDITORIAL: Cornelian Corner. J. A. M. A. **136**: 881, Mar. 27, 1948.

[19] ALDRICH, C. A., and HEWITT, E. S.: Self-regulating feeding program for infants. J. A. M. A. **135**: 340–342, Oct. 11, 1947.

Factors influencing the mother to breast feed or not to breast feed may be described as (*a*) heredity and (*b*) environment. Because the ability to nurse is often considered to be transmitted from mother to daughter, heredity is believed to be an important factor. If the maternal and paternal grandmothers successfully breast fed the mother and father of the prospective newborn, breast feeding is much more likely to be successful; and also to be anticipated. Environment may be described as:

(*a*) The attitude of the husband, friends, and relatives of the mother before parturition and after her return home from the hospital.

(*b*) The obstetrician who exerts the first and most important medical influence on the pregnant mother in preparing her emotionally and physically to breast feed her offspring. Breast feeding should be strongly advocated at the patient's first visit and during the latter months of pregnancy, repeated examinations of the maternal breasts and nipples should be made to assure the infant of a satisfactory vehicle (tough and elastic nipples) in obtaining nourishment from the mother. All too often a mother has plenty of milk but fissured nipples. Breast feeding is either abruptly terminated or the infant nurses less and less until there is no milk. Fissured nipples frequently lead to breast infections after which a mother is rarely successful in breast feeding.

(*c*) The pediatrician comes onto the scene after the baby has arrived and all too often after the decision has been made by the mother and the obstetrician concerning the advisability of attempting breast feeding. If he sees the newborn infant early, much depends upon his handling of the mother and the care of her nipples. During the first 2 or 3 days, a normal infant will obtain the colostrum and early breast milk by nursing for short periods of time, 5 to 8 minutes 3 times a day. As soon as the breasts begin to fill and the milk is obtainable, one breast should be emptied at each feeding, the infant being allowed to nurse as long as he desires.

I think it extremely important that only water or glucose water be offered the newborn until the mother's breasts have been given the opportunity to function. An initial weight loss of from 10 to 11 percent can be considered physiologic and prelacteal feedings should not be ordered unless this weight loss is exceeded. Infants who are offered water frequently do not have "dehydration fever," and often do not lose 10 or 11 percent of birth weight. Because some mothers have a sudden increase in milk as early as the third day, one would think that their infant should be allowed to nurse on a "self-demand" schedule at this time. Infants of mothers who have been given large doses of analgesics are often drowsy during the first 24 or 48 hours of life and as a result are not vigorous nursers.

I have recently observed four newborn infants of mothers delivered naturally according to the philosophy of Read.[20] Each of these mothers successfully breast-fed their infant. It is of interest that these mothers requested natural childbirth after reading "Childbirth Without Fear" by Read. They also anticipated breast feeding and were allowed to nurse their infants on a "self-demand" feeding schedule upon leaving the hospital on the third, fourth, or fifth day. These mothers are amazing. They hold or have their baby close enough to touch while still in the delivery room. They are euphoric and talk of their baby and their husband while expelling the placenta or having the episiotomy repaired. The picture of buoyancy in these mothers is quite a pleasant contrast to that of mothers delivered under heavy analgesia or anesthesia. Naturally, only an emotionally mature woman would elect the "Childbirth Without Fear" method of delivery. This type mother would also be expected to enter the nursing act with the same enthusiasm she exhibited during delivery, and be successful.

Natural childbirth, breast feeding, and a "self-demand" schedule of feeding appear to be intimately related to each other. It is quite likely that the incidence of breast feeding will materially increase if natural childbirth becomes popular once again. This will greatly depend on whether the obstetricians use psychology or drugs on the mother in childbirth. There is a place for both. The foundations of mental health are said to be laid in infancy. Infancy begins at birth and it appears reasonable to suppose that childbirth itself should be an emotionally satisfactory experience for the mother if an adequate mother-infant relationship is to be established.

Soraneus,[21] in the second century, advocated weaning at from 1½ to 2 years. This practice persisted until the twentieth century. The relative safety of modern methods of artificial feeding renders such long periods of breast feeding unnecessary and unwise. A mother is entitled to know of some definite plan in the nourishing of her infant even though it is to be breast fed. Ideally, a "self-demand" solely breast feeding schedule should be maintained as long as the infant thrives. Vitamins A, C, and D should be prescribed during the first month. Complementary feedings may be offered if there is an obvious breast milk deficiency. Offering water after each breast feeding will indicate the need of a complementary feeding. If an infant consistently takes more than 1 ounce of water after a breast feeding or more than 8 ounces of water daily, it is not being satisfied at the breast.

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[20] READ, G. D.: Childbirth Without Fear. Harper and Brothers, New York, N. Y., 1944. p. 259.

[21] SORANEUS quoted by ABT, I. A. in Brennemann's Practice of Pediatrics, vol. 1. W. F. Prior Co., Hagerstown, Md. 1948. Chap. 1, p. 6.

Early cereal feedings as suggested by Stewart [22] often provide sufficient nourishment to prolong complete breast feeding.

Every mother should be requested to continue breast feeding for at least 1 month even though complementary feedings are necessary. If she has a bountiful supply of breast milk, the infant may be nursed for from 5 to 7 months. An occasional relief bottle serves a double purpose of allowing the mother to be away at a feeding time; and conditions the infant for the time when weaning is indicated. Animals stop feeding their offspring when they erupt teeth. In human beings, this usually occurs between 5 and 7 months of age. Many infants may be weaned at this time from the breast nipple to a cup or glass, thus avoiding bottles.

It is our duty to encourage breast feeding as the infant's initial food. The purpose may be said to be twofold; (*a*) to nourish the infant, and (*b*) to establish a normal mother-infant relationship.

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[22] STEWART, C. A.: Feeding infants. New Orleans M. & S. J. 95: 225–227, Nov. 1942.

# Transposition of the Great Cardiac Vessels

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IN THE past decade there has been a spectacular accumulation of knowledge about congenital heart disease. Cardiac defects of developmental origin have been classified on a sound functional and diagnostic basis, and surgical procedures have been designed and successfully instituted for the correction of these defects.[3-7] It is considered of value to report a recent case in which there was transposition of the great vessels plus an unusual vascular anomaly of the pulmonary circuit. In the light of recent partially successful surgical efforts by Blalock[8] and others to correct a related condition, this case is believed to be of current interest.

## CASE REPORT

The patient was a well-developed, well-nourished, white male infant delivered uneventfully at full term 1 January 1950 at the 12th Station Hospital, Fort Clayton, C. Z. The mother had no known infectious illness during her pregnancy. Her blood type was "O," Rh-positive. At birth the baby was cyanotic, but on two occasions within the first few hours, showed marked transient pallor. The baby was

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[1] Board of Health Laboratory, Ancon, C. Z.

[2] 12th Station Hospital, Fort Clayton, C. Z.

[3] TAUSSIG, H. B.: Congenital Malformations of the Heart. The Commonwealth Fund, New York, N. Y., 1947.

[4] ABBOTT, M. E.: Atlas of Congenital Cardiac Disease. American Heart Association, New York, N. Y., 1936.

[5] BLALOCK, A., and TAUSSIG, H. B.: Surgical treatment of malformations of heart. J. A. M. A. 128: 189–202, May 19, 1945.

[6] GROSS, R. E., and HUBBARD, J. P.: Surgical ligation of patent ductus arteriosus; report of first successful case. J. A. M. A. 112: 729–731, Feb. 25, 1939.

[7] CRAFOORD, C., and NYLIN, G.: Congenital coarctation of aorta and its surgical treatment. J. Thoracic Surg. 14: 347–361, Nov. 1945.

[8] BLALOCK, A., and HANLON, C. R.: Surgical treatment of complete transposition of aorta and pulmonary artery. Surg., Gynec. & Obst. 90: 1–5, Jan. 1950.

placed in an incubator and given oxygen continuously. Examination revealed normal pulmonary aeration, a good cry, no heart murmur or thrill, and moderate cyanosis most prominent about the mouth and upper extremities. No developmental anomalies were observed externally. The birth weight was 3,200 grams. Penicillin, 20,000 units every 3 hours, was given intramuscularly as a prophylactic measure. Little difficulty with bronchial secretions was encountered. The baby nursed well but experienced respiratory distress and increasing cyanosis during this interval. Repeated blood counts revealed a progressive anemia. Roentgenograms suggested possible enlargement of the right side of the heart, no prominence of the pulmonary conus, and a poorly outlined aortic shadow. No electrocardiograms were made. The patient died on the fifteenth day in moderate cyanosis.

*Autopsy findings.*—There was pronounced cyanosis of the lips and mucous membranes of the mouth. The nail beds of the fingers were cyanotic, but not so cyanotic as were those on the toes. The right lung weighed 47 grams and the left, 43 grams. The lungs were uniformly subcrepitant with scattered foci of atelectasis. The bronchial tree appeared to be normal. The right lung exhibited a small accessory upper lobe with an accompanying accessory vein that drained into the superior vena cava just above the level of the azygos vein. The pulmonary veins, two from each lung, emptied into the left auricle. The heart weighed 35 grams. There was a transposition of the great vessels, the aorta arising from the right ventricle and the pulmonary artery from the left ventricle. Otherwise, both vessels pursued their usual course. The circumference of the aorta at its origin was 2.6 cm., whereas that of the pulmonary artery was 2.5 cm. The ductus arteriosus was normally located, patent, and measured 4 mm. in diameter. The superior and inferior vena cavae emptied into a moderately dilated right auricle. There was a patent foramen ovale, measuring 1 cm. in diameter, possessing two lesser fenestrations about 2 mm. in diameter. The wall of the right ventricle, 1 cm. below the auriculoventricular groove, measured 5 mm. The left ventricle, in a similar position, measured 3 mm. The interventricular septum showed no defect. The valves and coronary vessels were normal.

*Anatomic diagnosis.*—(*a*) Transposition of the great vessels, (*b*) patent foramen ovale with two central fenestrations, (*c*) patent ductus arteriosus, (*d*) accessory right pulmonary vein draining into the superior vena cava, (*e*) accessory upper lobe of the right lung, and (*f*) dilatation and hypertrophy of the right side of the heart.

## DISCUSSION

*Mechanism of circulation.*—Transposition of the great vessels exerts practically no ill effect during intrauterine life.[3] The anomaly may even favor proper oxygenation. For this reason the fetus ordinarily reaches full term and encounters difficulty only after birth in the effort to adapt to the demands of independent respiration. The intrauterine circulation is accomplished by the right ventricle pumping blood through the aorta to the systemic circulation (fig. 1). A portion of the blood passes from the right auricle through the patent foramen ovale to the left auricle, then to the left ventricle, and is pumped against the high pressure of the collapsed lungs through the ductus to the aorta, thereby contributing additionally to the systemic oxygenation.

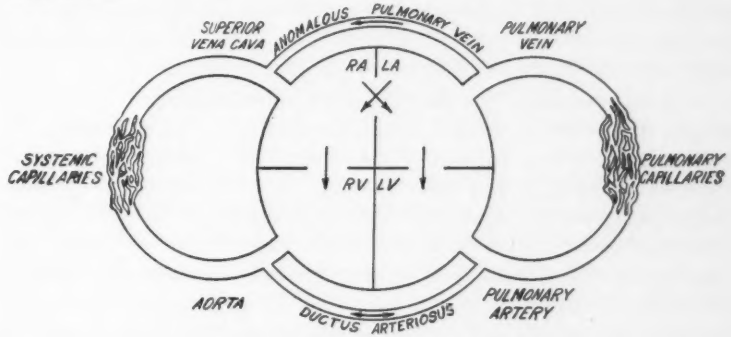


*Figure 1.*

The problem after birth is more critical. The life of the baby depends on the volume of the shunt and the means by which the systemic circulation is oxygenated. Until birth the work of the ventricles was about equal, and the walls of the two ventricles of equal thickness. When respiration is established and the lungs are expanded, blood flows from the left ventricle through the pulmonary arteries to the lungs, returning to the left auricle via the pulmonary veins. In this case, because the anomalous right pulmonary vein emptied into the superior vena cava, some oxygenated blood reached the right auricle. There was an additional shunt and mixture of blood through the foramen ovale. The blood also had to be shunted from the aorta via the ductus to the pulmonary artery to complete the circuit.

This mechanism does not persist. Transposition of the great vessels produces a situation in which a given volume of blood shunted from the pulmonary to the systemic circulation or vice versa cannot return to that side of the heart from which it was diverted unless there

is an equal and opposite shunt. According to Bing,[9] one must postulate, therefore, that equal volumes of blood are reciprocally shunted from one circulation to the other. The possibility still exists that the shunt may, over a short period, be predominantly toward one side. Taussig [3] has pointed out that fluoroscopically there may be a rhythmic increase and decrease in the size of the auricles strongly suggestive of a periodic shift of the intracardiac shunt. It must be reasoned, therefore, that this same alternation in the direction of blood flow may also occur in the patent ductus.

According to Taussig, transposition of the great vessels is not an infrequent congenital cardiac defect. In a series of 100 cases compiled by Rutledge,[10] however, not one case of transposition was recorded It is suggested that this condition, although not rare, is of unusual occurrence in most general hospitals. Because of this low incidence, it is considered appropriate to review the diagnostic features as well as the prognosis relative to recent surgical advances.

*Inspection reveals:* (*a*) No evidence of maldevelopment caused by circulatory embarrassment in intrauterine life. (Oxygenation difficulties begin with severence of the cord.) (*b*) Moderate to severe dyspnea increased by crying or nursing. (*c*) Dilatation of the neck veins. (*d*) Rhythmic ebb and flow of the degree of cyanosis intensified by exertion. (*e*) A lesser degree of cyanosis of the lower extremities compared to the upper, the line of demarcation usually lying at the brim of the pelvis.

*Chest:* (*a*) Rapid and shallow respirations. (*b*) Variable and intermittent degrees of pulmonary edema, depending on pressure relationships in the pulmonary and systemic circuits, and the presence or absence of heart failure.

*Heart:* (*a*) Enlarged to the right. (*b*) Rhythm frequently normal, but often there is a variable tachycardia. (*c*) Murmurs and thrills of many types may be encountered, but their interpretation is of doubtful significance.[3] They give little or no aid in establishing a diagnosis. (*d*) Electrocardiographic changes are not diagnostic, but in the event of rhythmic cyanosis with a normal electrical axis, an intracardiac shunt and transposition of the vessels must be considered. Ordinarily, right axis deviation is present.

*Fluoroscopy and roentgenography.*—These studies constitute one of the greatest single aids in diagnosis.[3] Significant findings are:

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[9] CAMPBELL, J. A.; BING, R. J.; ET AL.: Physiological studies in congenital heart disease; physiological findings in two patients with complete transposition of great vessels. Bull. Johns Hopkins Hosp. 84: 269–278, Mar. 1949.

[10] RUTLEDGE, D. I.: Approach to diagnosis of common types of congenital heart disease. J. A. M. A. 141: 1290–1297, Dec. 31, 1949.

(*a*) Pulmonary congestion; (*b*) pulmonary conus smaller than usual; (*c*) pronounced enlargement of both ventricles; (*d*) narrow aortic shadow in the anterior-posterior position, and a wide aortic shadow in the left anterior oblique position; and (*e*) rhythmic changes in the size of the right auricle.

*Cardiac catheterization.*—Determination of the differences in oxygen saturation and differences in blood pressure in the various chambers of the heart are of value in identifying this condition. These studies, however, are limited at present to the experienced operator and only supplement the impressions arrived at by other clinical criteria. Much information can be gained by these studies regarding the direction of blood flow, septal defects, possible shunts, and stenoses. In transposition of the great vessels, there is usually a higher degree of oxygen saturation in the right auricle than in the superior or inferior vena cava. In our patient, however, this finding would have been paradoxical because the rare anomalous right pulmonary vein entering the superior vena cava elevated the oxygen tension ordinarily present, thereby more nearly approximating the oxygen tension of the right auricle. In future catheterization studies of the right heart, this anomaly should be borne in mind. Aortic blood distal to the ductus, when the foramen ovale is patent, shows a higher oxygen tension than blood proximal to the ductus.

*Surgical prognosis.*—Blalock [8] has recently contributed a summary of his surgical results in this relatively hopeless condition. Although his survival rate has been quite low, it is of dramatic interest that any success was obtained at all. His series included 37 patients treated by some type of extracardiac venous or arterial shunt, by the creation of an auricular septal defect, or by a combination of these two methods. The combination procedure apparently offers the greatest chance for improvement. Although in this series there were only 15 survivors, 9 of these have been the most recent consecutive cases. This implies a consistent advance in technic. Blalock infers that the eventual ideal surgical procedure must entail a true anatomic correction of the defect, but this must await the development of artificial pumping and oxygenating devices.

## SUMMARY

In a classical case of transposition of the great cardiac vessels an anomalous pulmonary vein emptied into the superior vena cava. A source of error in the interpretation of cardiac catheterization studies is possible in the presence of this unusual anomaly.

# Apocrine Hamartomas[1]

JACOB L. GRUND, *Lieutenant Colonel, MC, A. U. S.*[2]
CAMPBELL A. MCNICOL, *Captain, MC, U. S. A.*

APOCRINE tumors with distinctive morphologic apocrine cell characteristics as such are extremely rare. The probability that these growths may occur more commonly than is generally supposed is suggested by the appearance of two patients with this condition in this hospital within 1 week. In one the tumor was made up predominantly of apocrine gland cells. In the other, the tumor consisted almost in its entirety of apocrine duct cells. Although in both instances a correct clinical diagnosis was suggested by the location of the tumors in areas where apocrine glands are usually found, their true nature was conclusively revealed only by excision and histologic examination.

## CASE REPORTS

*Case 1.*—A 35-year-old woman had noticed a small growth on her right labium majorum for 7 years. It had gradually grown in size until it was the size of a large pea. It was painless and had never "broken down." On 3 November 1949 it was excised. The overlying epithelium was normal and the tumor was about 6 mm. in diameter. On microscopic examination the surface epithelium was found to be intact. The tumor mass, located in the corium, appeared encapsulated and was not connected with the epidermis. It was composed of anastomosing and interlacing villuslike structures resembling glands, which projected into a cystlike lumen (fig. 1). The glandlike structures were lined by a single layer of columnar cells, some of which were secretory. These cells had faintly eosinophilic cytoplasm (fig. 2). In some peripheral portions of the section, where encapsulation was not complete, occasional myoepithelial cells were visible, indicating that the growth was not entirely excised. The general impression, however, was that of a benign growth. The location of the tumor and the histologic appearance were strikingly similar to Lever's[3] description of hidradenoma papilliferum ("adenoma of apocrine glands").

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[1] Murphy General Hospital, Waltham, Mass.
[2] Chief of Dermatology, Boston Regional Office, U. S. Veterans' Administration.
[3] LEVER, W. F.: Histopathology of the Skin. J. B. Lippincott Co., Philadelphia, Pa., 1949, pp. 301–305.

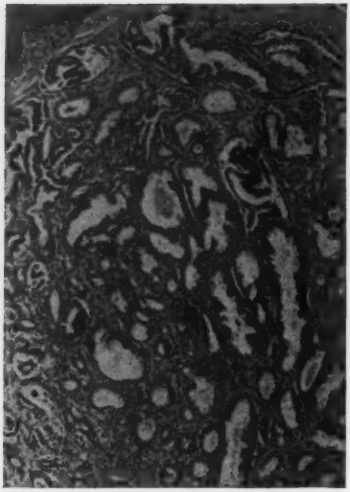

*Figure 1.—Hidradenoma papilliferum. The tumor consisted of glandular structures which interlaced and projected into a cystlike lumen.*

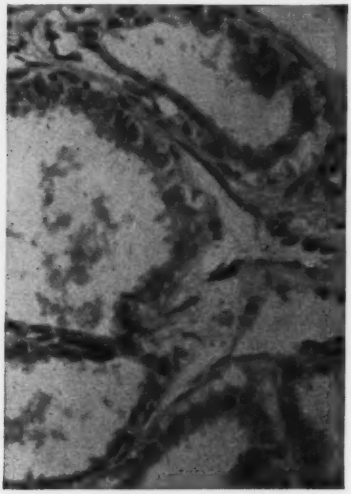

*Figure 2.—Hidradenoma papilliferum. The glandular structures were lined by a single layer of columnar cells some of which were actively secreting and which resembled apocrine gland cells.*

*Case 2.*—A 19-year-old man had a "birth mark" on the top of his head all his life. It was always "irritated by combing." Since March 1949, it had been ulcerated. It was excised on 27 October 1949. The specimen consisted of an elliptical fragment of skin and subcutaneous tissue measuring 4 by 1.5 cm. Numerous hairs projected from its surface, which also presented small cauliflowerlike growths varying in color from gray to gray-brown.

Microscopic examination revealed a tumor mass located in the upper corium. The epidermis on either side of the mass was acanthotic. On following the normal epidermis to the area of the tumor, an invagination of the surface epithelium with the formation of projecting villuslike structures into a cystic space formed by the invaginating epidermis on either side was seen (fig. 3). The villi were lined by a double layer of epithelium: an outer small cuboidal layer with round basally placed nuclei and an inner high cylindrical layer with elongated oval-shaped nuclei. The latter nuclei showed subnuclear vacuolization, probably representing active secretion (fig. 4).

The stroma of the villi contained many small capillaries and was heavily infiltrated by polymorphonuclear and plasma cells, with the latter predominating (fig. 5). Lying directly beneath the villous portion of the tumor in the corium were numerous dilated apocrine glands (fig. 6). The upper corium was infiltrated by plasma cells in all areas, most noticeable in the areas underlying the tumor. Both grossly and histologically the growth seemed to have been removed with a wide margin of safety. There was no evidence of invasiveness. Clinically and histologically, the tumor was an exact counterpart of the appendage tumor described by Lever [3] as a "syringocystadenoma papilliferum," a term used to designate a growth with apocrine duct cell morphology.

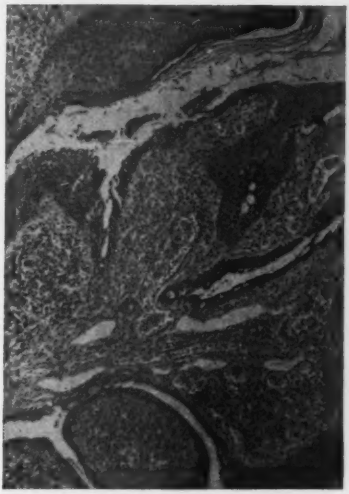

*Figure 3.—Syringocystadenoma papilliferum showing cystic invagination of epidermis with projecting villus-like structures into cystic space. Hyperkeratosis and acanthosis were evident.*

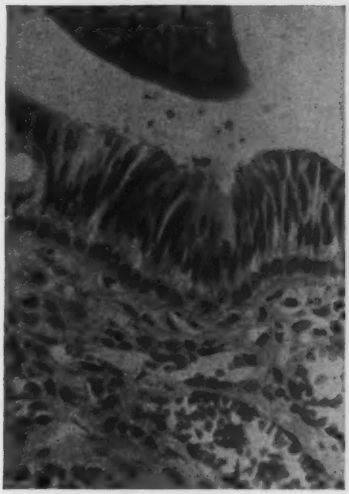

*Figure 4.—Syringocystadenoma papilliferum. High magnification of figure 3 showing inner high cylindrical, secretory, apocrine duct cells and an outer row of small cuboidal myoepithelial cells.*

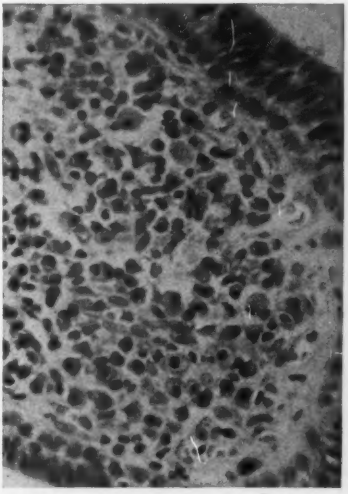

*Figure 5.—Syringocystadenoma papilliferum showing villus stroma containing small capillaries and predominant plasma cell infiltration. A few polymorphonuclear cells were present.*

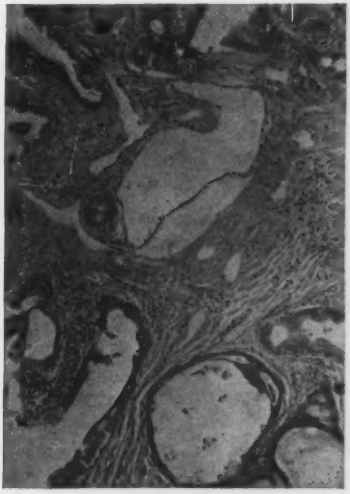

*Figure 6.—Syringocystadenoma papilliferum showing dilated apocrine glands in corium beneath villus portion of tumor.*

The histologic slides from both of our patients were examined by Dr. Lever who concurred in the diagnoses.

## COMMENT

Most articles dealing with the type of tumor described in this article, group them under the general heading of sweat gland tumors, disregarding the fact that there are two types of sweat glands in the skin, each with special distribution, variation in size, distinctive morphology, and with different staining properties. They are the eccrine and apocrine glands and their respective ducts. The types of tumor described in this article are believed by Lever [4 5] to be of apocrine origin because their cells are essentially similar to those of the apocrine glands and ducts. The presence of apocrine glands in intimate contact with the tumor and the demonstrable direct connection between the two tend to confirm this belief.

Previously, Beck [6] had stated that syringocystadenoma papilliferum was of apocrine origin. Danforth [7] has also expressed the opinion that hidradenomas of the vulva were derived from apocrine structures. It is probable that McDonald's [8] 30 cases of "apocrine sweat gland carcinoma of the vulva" were in reality papillary hidradenomas. None of the latter's patients showed recurrence and in none was metastases observed. Lever,[4 5] after examining the photomicrographs in McDonald's article, believed that the tumors were papillary hidradenomas and that the cells described as infiltratively carcinomatous were, in reality, benign myoepithelial cells.

Because tumors of apocrine origin are made up of cells essentially similar to those that make up normal apocrine glands and ducts, a description of the latter is necessary for the recognition and correct evaluation of the former. The apocrine glands, in contrast to the eccrine glands widely distributed in the human skin, are present only in the axillae, around the mammary nipples, in the perigenital and perianal regions, in the external auditory canals (ceruminal glands), and in the eyelids (Moll's glands). Occasionally a few apocrine glands are found on the scalp, chest, and abdomen. Relatively large,

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[4] LEVER, W. F.: Pathogenesis of benign tumors of cutaneous appendages and of basal cell epithelioma: benign tumors of cutaneous appendages. Arch. Dermat. & Syph. 57: 679–708, Apr. 1948.

[5] LEVER, W. F.: Pathogenesis of benign tumors of cutaneous appendages and of basal cell epithelioma; basal cell epithelioma. Arch. Dermat & Syph. 57: 709–724, Apr. 1948.

[6] BECK, S. C.: Syringoma. In JADASSOHN, J. (editor): Handbuch der Haut- und Geschlechtskrankheiten. Band XII, Teil 3; Geschwülste der Haut, 2, bearbeitet von S. C. Beck und anderen. Julius Springer, Berlin, 1933. p. 458.

[7] DANFORTH, W. C.: Hydradenoma vulvae. Am. J. Obst. & Gynec. 45: 329–333, Feb. 1943.

[8] MCDONALD, J. R.: Apocrine sweat gland carcinoma of vulva. Am. J. Clin. Path. 11: 890–897, Dec. 1941.

they secrete a fatty odorous substance in addition to sweat. Way and Memmesheimer[9] consider them "accessory sexual glands." They originate from the primary epithelial germ layer together with hair and with sebaceous glands and, therefore, their ducts lead into pilosebaceous follicles and not directly to the epidermis.

Apocrine glands are tubular and actively secretory, the secretory portion being lined with only one layer of epithelial cells, the outer layer having become differentiated into myoepithelial cells. The secretory cells pass through a full cycle of secreting stages. They are low cuboidal at the beginning of the cycle, and gradually increase in height until they protrude into the lumen into which they release part of their cytoplasm. The lumen of the secretory portion of the apocrine glands is 10 times the diameter of the eccrine sweat glands. The secretory cells take a distinctly eosinophilic stain in contrast to the corresponding excretory cells of sweat (eccrine) glands, which take a slightly basophilic stain. The apocrine duct is lined by 2 layers of epithelial cells that take a slightly eosinophilic stain in contrast to the sweat duct cells which take a deeply basophilic stain.[3] It should be possible to ascertain the presence of the preceding features in the histologic examination of apocrine growths.

The essentially benign nature of hidradenoma and syringocystadenoma papilliferum is supported by the thesis recently advanced by Lever[3,4] regarding the pathogenesis of tumors of the cutaneous appendages, the category into which these tumors fall. He classifies them as "primary epithelial germ tumors" because of their origin from the "primary epithelial germ cell." The latter is the embryonal structure from which the hair, the sebaceous gland, and the apocrine gland stem. The embryonal cell, originally destined to form one of these structures, may, after having attained a certain degree of development in its normal progression, be arrested in its growth. When, and if, these cells enter a state of neoplasia, the resulting growth differentiates toward either a sebaceous gland, apocrine gland, or hairlike structure. Lever terms them nevoid tumors or hamartomas and considers them benign neoplasms. With their complete removal, there should be no recurrence.

## SUMMARY

Although histologic examination is the only means whereby a definite diagnosis of hamartomas is possible, knowledge of the normal apocrine glands is of value, especially as to their location, essential morphology and their staining properties, since the tumor cell itself

[9] WAY, S. C., and MEMMESHEIMER, A.: Sudoriparous glands; apocrine glands. Arch. Dermat. & Syph. 38: 373–382, Sept. 1938.

is almost an exact replica of the normal apocrine gland and duct cell. In some instances apocrine tumors have been considered malignant. Their essentially benign character is, however, supported by a recent thesis emphasizing their embryonal nature, which in turn determines their possible future development into benign nevoid tumors or hamartomas.

# A Comparison of Ephedrine and Desoxyephedrine in Maintaining Blood Pressure During Spinal Analgesia

CLIFFORD A. BALDWIN, JR., *Captain, MC, U. S. A.*[1]

IT HAS become the custom among anesthesiologists and surgeons while performing spinal analgesia first to administer a drug of the pressor group in an effort to overcome the sympathetic obliterative effects of the spinal analgesic and to maintain the blood pressure at as near the preoperative level as possible. Numerous sympathomimetic agents have been used by many investigators [2] to find the drug that would perform the desired function most efficaciously. Ephedrine and desoxyephedrine (d-desoxyephedrine hydrochloride, which is available under several trade names) were chosen for this study because they have proved to be of value and are readily obtainable.

## METHOD

No attempt was made to select the 400 patients undergoing spinal analgesia. Insofar as possible consecutive cases were used; the first 100 (group I) received no vasopressor agent initially, the second (group II) received 25 mg. of ephedrine, the third (group III) received 50 mg. of ephedrine, and the fourth (group IV) received 15 mg. of desoxyephedrine. The blood pressure of all patients was recorded in the same manner. A diaphragm-type stethoscope was fastened over the brachial artery after the correct position had been palpated digitally. A wrap-around cuff was applied and attached to a floor model mercury manometer. The blood pressure was carefully noted prior to placing the patient in position for the administration

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[1] Walter Reed Army Hospital, Washington, D. C.

[2] DRIPPS, R. D., and DEMING, M. V.: Evaluation of certain drugs used to maintain blood pressure during spinal anesthesia; comparison of ephedrine, paredrine pitressin-ephedrine and methedrine in 2,500 cases. Surg., Gynec. & Obst. 83: 312–322, Sept. 1946.

of the spinal anesthetic. Following the administration of the anesthetic the blood pressure was recorded at 5-minute intervals throughout the surgical procedure. For the purposes of this study, however, only those blood pressure readings that were taken during the first 30 minutes were used. There was no appreciable effect from surgical intervention, and the amount of intravenous fluids given in this period was believed too small to be important. No patients received pentothal sodium during the period of study.

The vasopressor agent was administered with 1 percent procaine for infiltration at the site of lumbar puncture. There was a lapse of 3 to 10 minutes between the infiltration and the completion of the lumbar puncture. Three hundred fifty-four patients (88.5 percent) received a mixture of procaine and tetracaine hydrochloride as the anesthetic agent. Five milligrams of procaine were given with each milligram of tetracaine hydrochloride, the maximum dose being 60 mg. of procaine and 12 mg. of tetracaine hydrochloride. Thirty-eight patients (9.5 percent) received procaine, 3 (0.75 percent) received heavy dibucaine hydrochloride, 2 (0.5 percent) received tetracaine hydrochloride with *d*-glucose, and the remaining 3 (0.75 percent) received only tetracaine hydrochloride. All patients were given a single injection of the anesthetic.

Additional vasopressor drugs were administered if (*a*) in the opinion of the anesthesiologist the condition of the patient warranted it and (*b*) the systolic blood pressure fell to 80 mm. The levels of analgesia were determined by loss of pinprick sensation. It has been shown that this loss of sensation and the level of sympathetic paralysis are closely related.[3]

## RESULTS

The results are shown in table 1 and figure 1. In general the average fall in systolic blood pressure during the 30-minute period of observation tended to increase as the level of sympathetic involvement rose. Only 4 patients in group II fell into the critical range or reached the critical level and were given an additional dose of vasopressor drug either intravenously or intramuscularly, in contrast to the 26 patients in the control group who required such therapy. In group III, 70 patients showed no fall in blood pressure. It was not necessary to administer an additional vasopressor drug to any patient in this group. One patient showed a fall in blood pressure of 42 mm., but was not considered to be in the critical range. In group IV, 60 patients showed no fall in blood pressure, and it was necessary to administer an additional vasopressor to 5.

[3] SARNOFF, S. J., and ARROWOOD, J. G.: Differential spinal block; preliminary report. Surgery 20: 150–159, July 1946.

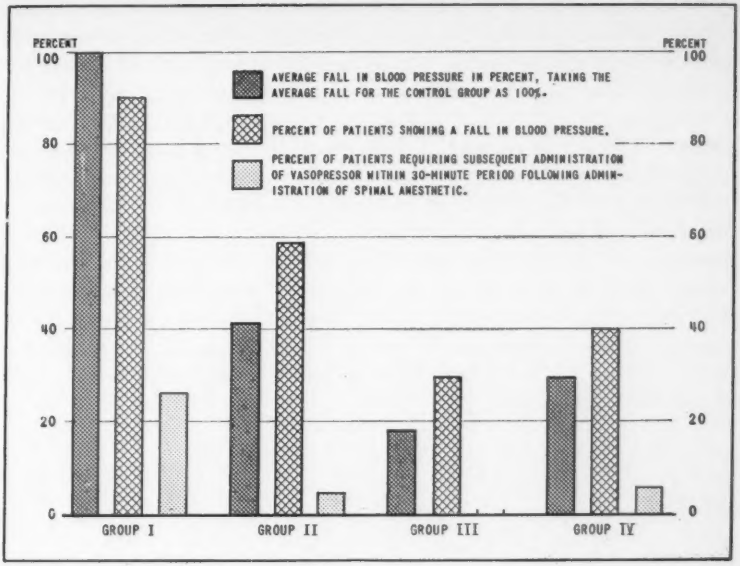
PERCENT
100
80
60
40
20
0
AVERAGE FALL IN BLOOD PRESSURE IN PERCENT, TAKING THE AVERAGE FALL FOR THE CONTROL GROUP AS 100%.
PERCENT OF PATIENTS SHOWING A FALL IN BLOOD PRESSURE.
PERCENT OF PATIENTS REQUIRING SUBSEQUENT ADMINISTRATION OF VASOPRESSOR WITHIN 30-MINUTE PERIOD FOLLOWING ADMINISTRATION OF SPINAL ANESTHETIC.
GROUP I
GROUP II
GROUP III
GROUP IV

*Figure 1.*

TABLE 1.—*Fall in blood pressure in the four groups*

| Level of spinal analgesia | Number of patients | Average fall in blood pressure (in millimeters) | Number of patients without fall in blood pressure | Patients given supplemental vasopressors | |
|---|---|---|---|---|---|
| | | | | Number | Percent |
| Group I: | | | | | |
| T4-T6 | 34 | 35.5 | 0 | 13 | 38.2 |
| T7-T8 | 20 | 26.0 | 0 | 7 | 35.0 |
| T9-T10 | 34 | 13.0 | 8 | 4 | 11.8 |
| T11 or lower | 12 | 15.3 | 2 | 2 | 16.7 |
| Total | 100 | 23.5 | 10 | 26 | 26.0 |
| Group II: | | | | | |
| T4-T6 | 31 | 17.5 | 8 | 2 | 6.5 |
| T7-T8 | 19 | 8.4 | 8 | 2 | 10.5 |
| T9-T10 | 22 | 6.8 | 9 | 0 | 0.0 |
| T11 or lower | 28 | 5.1 | 16 | 0 | 0.0 |
| Total | 100 | 9.9 | 41 | 4 | 4.0 |
| Group III: | | | | | |
| T4-T6 | 33 | 5.6 | 22 | 0 | 0.0 |
| T7-T8 | 15 | 4.5 | 8 | 0 | 0.0 |
| T9-T10 | 21 | 1.7 | 16 | 0 | 0.0 |
| T11 or lower | 31 | 4.3 | 24 | 0 | 0.0 |
| Total | 100 | 4.2 | 70 | 0 | 0.0 |
| Group IV: | | | | | |
| T4-T6 | 36 | 11.0 | 19 | 3 | 8.3 |
| T7-T8 | 22 | 5.6 | 15 | 1 | 4.5 |
| T9-T10 | 22 | 4.6 | 13 | 0 | 0.0 |
| T11 or lower | 20 | 4.6 | 13 | 1 | 5.0 |
| Total | 100 | 7.1 | 60 | 5 | 5.0 |

Some degree of fall in blood pressure was seen in 90 percent of the control group. It was necessary to administer a vasopressor drug to 26 percent of these patients. It appears that 25 mg. of ephedrine prophylactically is of value; the average blood pressure fall in group II was 9.9 mm. or about 40 percent of the average fall in the control group. Fifty-nine percent of the patients in this group showed a fall in blood pressure as compared to 90 percent in group I. It was necessary to repeat the ephedrine in 4 percent because of a fall in blood pressure to or below the critical level. In group III the average blood pressure fall was 4.2 mm. and only 30 percent showed a fall. The critical level was not reached in any case. The average blood pressure fall in group IV was 7.1 mm. and 40 percent of these patients showed no fall in blood pressure. Five percent required additional administration of a vasopressor drug because the blood pressure fell to or below the critical level.

## DISCUSSION

The physiologic change underlying the fall in blood pressure following the administration of a spinal anesthetic is a segmental paralysis of sympathetic vasoconstrictor fibers to the blood vessels.[3] These fibers are the thoracolumbar component of the autonomic nervous system. The higher the level of paralysis produced, the greater the area of vasodilatation. It is the function of an efficient vasopressor agent to counteract this effect. It has been proved that ephedrine raises the blood pressure primarily by its direct action on the myocardium.[4] Desoxyephedrine raised blood pressure by increasing peripheral resistance. This difference of mode of action is important in patients with arteriosclerosis or a damaged myocardium.

## SUMMARY

Four hundred patients were studied to determine the relative value of ephedrine and desoxyephedrine in combating the hypotension produced by the administration of a spinal anesthetic agent. Fifteen milligrams of desoxyephedrine given prophylactically is more effective than 25 mg. of ephedrine and less effective than 50 mg. of ephedrine.

[4] GOODMAN, L., and GILMAN, A.: The Pharmacological Basis of Therapeutics. The Macmillan Co., New York, N. Y., 1941. p. 426.

# Herpes Zoster Concurrent With Varicelliform Eruption

## Report of Five Cases

ARVIN T. HENDERSON, *Lieutenant, MC, U. S. N.*[1]
DONALD C. YOUNG, *Commander, MC, U. S. N. R.*[2]

THE relationship between varicella and herpes zoster was expressed by Von Bokay [3] in 1888. The foreign literature contains reports of concurrent herpes zoster and chickenpox but few reports are found in American publications.[4-8] Five cases were admitted to the communicable disease service of Herman Kiefer Hospital in the past 2 years.

### CASE REPORTS

*Case 1.*—A 59-year-old white woman was admitted to a general hospital complaining of pain of 1-day duration above the left eye, followed by an eruption. When a monolocular rash characteristic of chickenpox appeared, she was transferred to this hospital. Physical examination showed a moderate number of vesicles on erythematous bases scattered over the abdomen, back, and upper portion of her extremities. Over the left side of the forehead and periocular region were vesiculopustular lesions, some of which were crusted. The left upper and lower eyelids were congested and edematous. The con-

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[2] Medical Director of the Communicable Disease Service, Herman Kiefer Hospital, Detroit, Mich.

[3] VON BOKAY, J.: Magyar Orvosi Archivum Nov. 3, 1892. Cited by Barrett.[8]

[4] TOP, F. H., and others: Communicable Diseases. 2d edition. C. V. Mosby Co., St. Louis, Mo., 1947. p. 425.

[5] DIRECTOR, W.: Zoster with varicelliform eruption; report of case. U. S. Nav. M. Bull. 42: 186–187, Jan. 1944.

[6] FISCHER, A. E.: Herpes zoster and disseminated vesicles (varicella?). J. Pediat. 2: 301–311, Mar. 1933.

[7] ALMEYDA, J.: Simultaneous occurrence of herpes zoster and varicella, with report of 3 cases. Post-Grad. M. J. 18: 175–177, Oct. 1942.

[8] BARRETT, C. C.: Herpes zoster and chickenpox. South. M. J. 31: 192–196, Feb. 1938.

junctiva of the left eye was injected and the left pupil dilated and oval in shape. Ulcerated lesions, which did not extend beyond the midline, were present on the mucous membrane of the left side of the soft and hard palate. She was treated symptomatically and when discharged on the seventh hospital day the chickenpox lesions were nearly healed and the lesions of herpes zoster had improved.

*Case 2.*—A 70-year-old white man had been well until 9 days prior to admission when he had a severe headache followed by the appearance of vesicles in the right frontal and parietal areas. Involution of the vesicles, followed by formation of crusts, was noted in the ensuing 48 hours. He was admitted to a general hospital where a papulovesicular rash, clinically resembling chickenpox, developed over the neck and trunk. Examination on admission to this hospital showed an acutely ill man. An erythematous, vesiculopustular rash was present over the right side of his forehead and the right upper and lower eyelids. The conjunctivae of both eyes were injected and a purulent discharge was present. Scattered monolocular, vesicular lesions, some of which were crusted, were present over the upper thorax, back, and neck. When the patient was discharged on the ninth hospital day the lesions of chickenpox were no longer visible and those of the herpes zoster were improved.

*Case 3.*—A 15-year-old white boy was admitted to the hospital complaining of pain of 4-day duration in the right eye, followed by severe pain over the right cheek and right frontal and parietal areas. The conjunctiva of the right eye became red and the lid swollen. Later, vesicles appeared on the entire right side of the face and scalp. Physical examination showed a moderately ill boy. The entire right side of the face was erythematous and numerous vesicles were present. The right upper eyelid was inflamed but otherwise the skin was clear except for a few macules and papules on the anterior chest wall. The right anterior cervical lymph nodes were tender and enlarged. Several white circumscribed plaques were noted on the mucous membranes of the mouth. Treatment with 40,000 units of penicillin every 3 hours and 50 mg. of thiamine hydrochloride every 6 hours was begun. On the following day practically all of the lesions on the chest wall were vesicular. Ten days later nearly all the lesions were healed and the crusts separated. A purulent exudate was still present in the right eye, but the cornea was clear and the conjunctiva was only slightly injected. He was discharged on the eleventh hospital day.

*Case 4.*—A 55-year-old white woman was well until 5 days prior to admission at which time she noted several papules on the right eye-

brow. On the following day the lesions were vesicular and painful and had spread over the forehead above the eyebrow but not beyond the midline. Two days later the conjunctiva of the right eye became injected. The day before admission the conjunctiva of the left eye had become involved and the patient noticed a generalized papulovesicular skin rash. Physical examination on admission showed a moderately ill woman. Several small vesicles and ulcers, without surrounding erythema, were present on the right cheek and extended to the margin of the lip. Bilateral periorbital edema, with more involvement of the upper lids, was present. A violaceous erythematous, indurated, tender eruption was present on the right side of the forehead. At the center of the eruption were several bullae containing clear fluid. A generalized maculopapular eruption with umbilicated vesicles was seen. The lesions on the forehead were not painful after the first hospital day and were well crusted by the fifth day. At the time of discharge, on the seventh day, the conjunctivitis was minimal and the chickenpox lesions were healing.

*Case 5.*—A 56-year-old white woman became ill 7 days prior to admission to this hospital, at which time she noted an erythema over the left side of the forehead and upper left eyelid. On the following day vesicles appeared on the erythematous areas and she had a left-sided headache. On the day prior to admission a generalized maculopapuloviscular eruption appeared on the trunk. Examination on admission revealed an acutely ill woman. There was a large area of erythema over the left side of the forehead and many small and large vesicles present. The upper and lower left eyelids were edematous and a purulent discharge was present. The bulbar conjunctiva was extremely injected. There were many small, discrete, palpable lymph nodes in the anterior cervical region. A moderate number of macules, papules, and vesicles were present on the body and face. The lesions progressed in the usual manner; the hospital course was uneventful, and the patient was discharged on the seventh day.

## DISCUSSION

Because animals are not susceptible to the virus of chickenpox, experimental evidence to verify the etiologic relationship between varicella and herpes zoster is lacking. For this reason all conclusions must be drawn from clinical studies. Netter and Urbain [9] in 1931 used the complement fixation test developed by Frei [10] and reported positive reactions in over 90 percent of cases of herpes zoster and

[9] NETTER, A., and URBAIN, A.: Le virus varicello-zonateux. Ann. de l'Inst. Pasteur 46: 17–26, Jan. 1931.

[10] FREI, M.: Herpes zoster and varicella. Jahrb f. Kinderh. 92: 281, 1920.

chickenpox. Amies [11] centrifuged and washed the elementary bodies from vesicular fluid from varicella and then agglutinated them with serum from persons convalescing from the disease. He was able to repeat the process, using the elementary bodies from herpes zoster, and also to cross agglutinate with zoster and varicella serums and vice versa. Bruusgaard [12] inoculated fluid from vesicles of herpes zoster into the arm of a 2-year-old child; after 9 days vesicles appeared locally. Fluid from the vesicles was in turn inoculated into two other children; each showed a local reaction at the site of inoculation, and 14 days later crops of vesicles, which were indistinguishable from those of varicella, appeared. Roxburgh and Martin [13] in 1926 considered the occurrence of varicella in persons also suffering from herpes zoster first to be due to an attack on the sensory nerve roots and then to a hematogenous dissemination of the virus as the cause of the local skin lesions of varicella.

Whether the two diseases are caused by two separate viruses or by a single virus is debatable. However, the evidence points strongly toward similar viruses, if not to a single agent. Our cases were characterized first by the appearance of skin lesions typical of herpes zoster, followed after a period of 1 to 6 days by the appearance of a monolocular, vesicular eruption on an erythematous base, occurring in crops. This eruption was indistinguishable from that of chickenpox. In none of our patients was a history of previous attacks of chickenpox or herpes zoster obtained. The varicelliform eruption resolved in the manner usual for chickenpox and independently of resolution of the herpes zoster. The laboratory examinations were normal in all patients.

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[11] AMIES, C. R.: Elementary bodies of herpes zoster and their serological relationship to those of varicella. Brit. J. Exper. Path. 15: 314–320, Oct. 1934.

[12] BRUUSGAARD, E.: Mutual relation between zoster and varicella. Brit. J. Dermat. 44: 1–24, Jan. 1932.

[13] ROXBURGH, A. C., and MARTIN, P. H.: Concurrent herpes zoster and varicella. Brit. J. Dermat. 38: 286–289, July 1926.

# Periarteritis Nodosa

## Report of a Case

RAYMOND J. LEFFLER, *Lieutenant, junior grade, MC, U. S. N.*[1]

A 47-YEAR-OLD white woman was admitted to a naval hospital in January 1949, with the chief complaint of "asthma," anorexia, and extreme weakness. Her first asthmatic attack occurred 2½ years prior to admission when she was living on Guam. As a result of the severe bronchial asthma, she was returned to the United States where she required almost continuous hospitalization. Treatment with penicillin and other drugs produced hypersensitivity. Her appetite was poor because of biliousness and nausea after eating. Her weight declined gradually from 128 to 65 pounds. She also noted cramping pains in the chest.

Physical examination on admission revealed an emaciated woman. Her blood pressure on admission was 100/75, but gradually rose to 150/100 terminally. Musical and coarse rales were heard over both lungs. She had a macrocytic, hypochromic anemia. The red blood-cell count ranged from 2.7 to 4.2 million. It was 3.7 million terminally. Differential white blood-cell counts showed an eosinophilia as high as 24 percent. The sedimentation rate was 33 mm. The urine persistently showed a small amount of albumin with fixed specific gravity of 1.007 and occasional showers of red blood cells; a Bence-Jones test was negative. The predominating organism on urine culture was hemolytic *Staphylococcus aureus*. The daily output of urine was frequently below 500 cc. and rarely over 1,000 cc. The serum A/G ratio was 2.3 : 3.5. Blood creatinine was 2 mg. per 100 cc. blood. Roentgenograms of the chest showed pulmonary emphysema and interstitial fibrosis. All other roentgenograms revealed no abnormalities. An EKG in March 1949, 3 months after admission, revealed "probable" myocardial damage. A supportive regime, including physiotherapy and a high calory, high vitamin diet, was prescribed. She gradually improved and the asthma became less severe. However,

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she showed a mild hemorrhagic tendency manifested by petechiae and ecchymoses of the skin and mucous membrane. During these episodes the number of platelets decreased but increased again in the interim. In July 1949, the asthmatic attacks became more frequent and severe, and she began to complain of transient numbness, hyperesthesia, and paresthesia. On 6 August 1949 she complained of headache and shortly thereafter a right flaccid hemiplegia occurred; she became comatose, and died 2 days later.

## AUTOPSY

*Gross examination.*—The subarachnoid space contained bloody fluid with small clots. This was most noticeable in the basilar region and extended over the left cerebellum and brain stem. There was an aneurysm (0.4 cm. in diameter) of the left superior cerebellar artery located about 0.3 cm, from the basilar artery. This aneurysm had a firm wall composed of laminated clot. No actual point of rupture was found, but the entire area was involved in a firm blood clot. The brain showed areas of hemorrhage and destruction in the left internal capsule and basal ganglia. The ventricles were dilated but did not contain blood. The thoracic cavity contained old firm, pleural adhesions at both apexes. The lungs were congested, edematous, emphysematous, and showed fibrosis. Many firm, old adhesions were present in the pericardial cavity over the left ventricle and septum anteriorly. The heart weighed 220 grams and was extremely flabby. The adrenal glands were atrophic. Each kidney was small, white, had a finely granular surface, and weighed 75 grams. No infarcts were present. The cortex was 0.3 to 0.4 cm in thickness. No vessels other than the superior cerebellar artery showed nodularity.

*Microscopic examination.*—Vacuolization, degeneration, and dilated small vessels were noted in the basal ganglia of the brain. There was hemorrhage into the Virchow-Robin spaces, and in some areas extending into the stroma itself. Destruction of the cerebral parenchyma and large hemorrhages were found in the internal capsule. Some of these areas showed extreme infiltration with polymorphonuclear leukocytes. Several capillaries and small arterioles of the brain showed fibrinoid degeneration of the wall with leukocytic infiltration including many eosinophils (fig. 1). Sections through the aneurysm of the left superior cerebellar artery showed a focal fibrinoid necrosis of its wall with perivascular leukocytic infiltration chiefly of eosinophils (fig. 2).

The kidneys showed diffuse and focal leukocytic infiltration and adhesions of the glomerular capsule. Many of the glomeruli were hyalinized (fig. 3). In a few small arteries and arterioles the walls

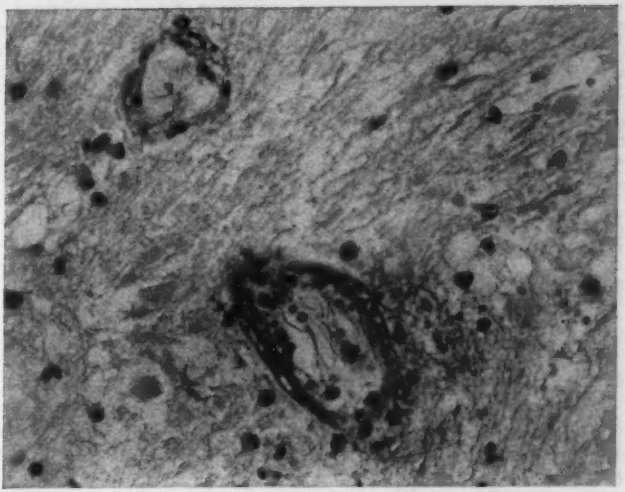

*Figure 1.—Section of brain showing fibrinoid necrosis of blood vessel walls with minimal leukocytic infiltration.*

contained areas of fibrinoid degeneration with minimal perivascular leukocytic infiltration (fig. 4). However, the principal vascular lesions were those of hypertension. The intima of the small arteries

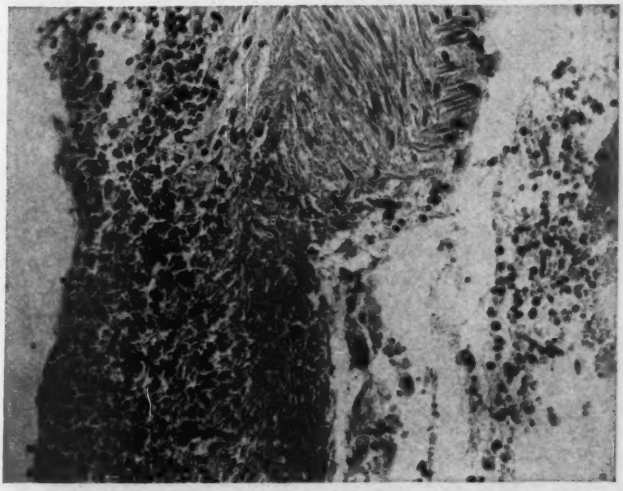

*Figure 2.—Section through the wall of the aneurysm of the left superior cerebellar artery. There is fibrinoid necrosis with intense adventitial eosinophilic infiltration at its junction with relatively normal artery wall.*

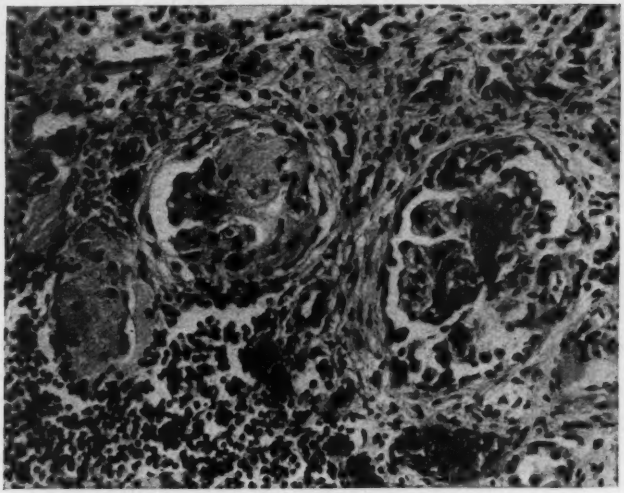

*Figure 3.—Section through kidney showing hyalinization of glomerular tuft, adhesions of glomerular tuft to Bowman's capsule, fibrosis of stroma, and lymphocytic infiltration of stroma.*

and arterioles was thickened due to increased collagenous and elastic tissue. The arterioles showed intimal fibrosis and hyaline degeneration, but no areas of necrosis. Many of the tubules were dilated and

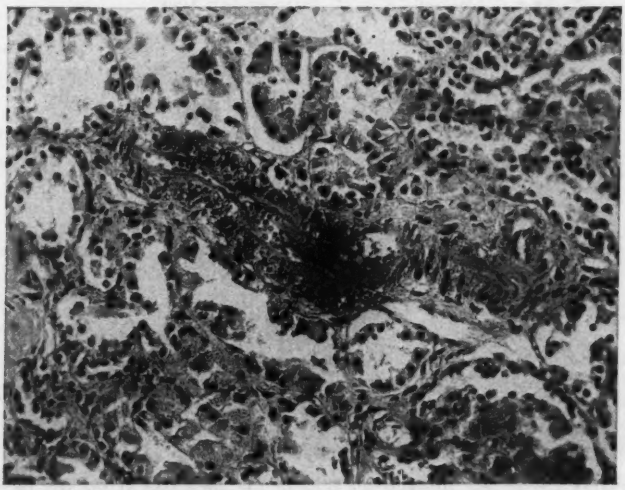

*Figure 4.—Section through arteriole of the kidney showing a fibrinoid necrosis in part of its wall. Associated leukocytic infiltration was not found.*

others were destroyed. The wall of the renal pelvis was thickened, edematous, and fibrous. There was moderate interstitial edema of the medulla.

Arteriosclerosis of the pulmonary arteries and fibrosis of the lung parenchyma with the formation of thick masses of granulation tissue were noted and many foreign body giant cells showing reaction to lipoid material were present. There were masses of lymphocytes, some with germinal centers. Congestion, edema, emphysema, and atelectasis were present.

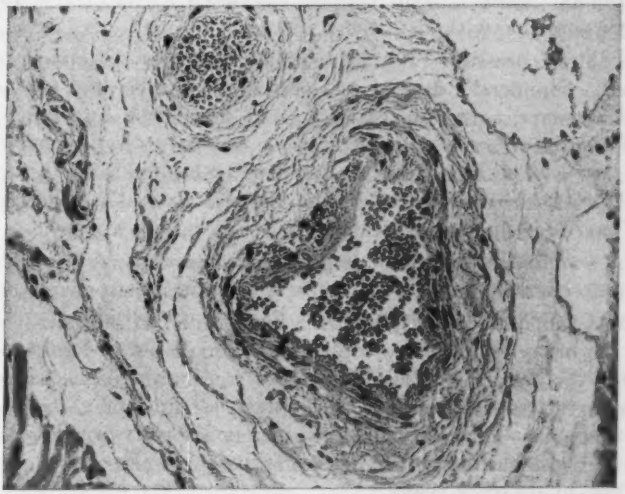

*Figure 5.—Section through heart showing a hyalinization of the arteriolar wall. Leukocytic infiltration was not noted.*

In the spleen, although there was degeneration of collagenous material of the blood vessel walls, this was no more advanced than one would expect in emaciation. Sections of the liver, adrenal glands, ovaries, colon, bladder, and heart showed fibrinoid necrosis of the vessel walls. The lesions in the heart showed little or no perivascular infiltration (fig. 5).

## DISCUSSION

This patient had chronic severe asthma for 2½ years prior to admission. Associated disease processes included hypersensitivity to drugs, nephritis with hypertension (150/100), and terminal cerebral hemorrhage. Her asthma was not considered typical, and it was thought that there was an underlying psychogenic factor since her asthma was not related to seasonal changes or any definite allergic

factor. No contributory infectious processes were found. The asthmatic attacks did not respond to conventional treatment and gradually became worse. However, the occurrence of multiple drug hypersensitivities suggested an allergic basis for her disease because exposure to certain substances precipitated asthmatic attacks.

The impaired urinary output, albuminuria, and occasional showers of red blood cells would suggest an acute nephritis, but the hypertension, the altered A/G ratio, and the low fixed specific gravity are more typical of chronic glomerulonephritis. No evidence of azotemia was found. These clinical features suggested a combined acute and chronic nephritis with an atypical picture.

The blood pressure (100/75) was low early in the course of the disease. Simmond's disease was once suspected because of the low blood pressure, anorexia, weakness, and emaciation but, during the last 8 months of her life, the blood pressure rose to a hypertensive level (150/100). The blood pressure is usually higher than this in the renal forms of hypertensive disease, but this patient's cachectic state may have been the reason the blood pressure was not higher.

The terminal brain hemorrhage was not an unusual clinical event and is frequently associated with nephritis and hypertension.

The asthma and nephritis, with a background of allergic disorders and the many subjective complaints of numbness and paresthesias, suggest the diagnosis of a widespread visceral angiitis such as occurs in periarteritis nodosa. The eosinophilia would tend to corroborate this diagnosis. The patient's age and sex are not incompatible with this diagnosis, although the disease occurs predominantly in men at an average age of 37 years.

The absence of cardiac disease, suggestive of an active rheumatic infection, precludes the consideration of rheumatic arteritis.

Lupus erythematosus usually shows skin lesions at the stage of the disease suggested by this case, and a greater hyperglobulinemia would be expected.

The clinical diagnoses were periarteritis nodosa; intracerebral hemorrhage, left middle cerebral artery; and asthma.

The hemorrhage into the left intracerebral area pointed to rupture of the lenticulostriate arteries incident to hypertensive disease. Inspection of the area of the largest blood clot at the base of the brain revealed an aneurysm of the left superior cerebellar artery but neither gross nor microscopic examination of this aneurysm revealed an actual rupture. However, the fact that main extracerebral hemorrhage was localized about this aneurysm pointed to rupture. No gross lesion of periarteritis nodosa was found in the remaining cerebral vessels nor

in the other vessels of the body. Examination of the lungs demonstrated extreme fibrosis with arteriosclerosis of the vessels which indicated chronic pulmonary disease rather than true bronchial asthma.

The kidneys, a common site for periarteritis nodosa, on gross examination revealed changes compatible with that disease. Microscopic examination revealed no definite evidence of periarteritis nodosa in the kidneys but rather a typical chronic glomerular nephritis (fig. 3). The rare lesions of the arteries in the kidneys did, at least, suggest periarteritis nodosa, with fibrinoid degeneration of part of the wall and minimal leukocytic infiltration. The photomicrograph shows the most advanced lesion, but this is not convincing (fig. 4). According to Harris et al.,[2] the kidneys are affected in 87 percent of the cases. However, with the associated chronic glomerular nephritis, some lesions of periarteritis may have been obscured. The heart did not present definite lesions either; Harris et al. report involvement of the cardiac vessels in 84 percent. Analysis by Ralston and Kvale [3] of autopsies in 30 cases of periarteritis nodosa from the Mayo Clinic reveals 8 showing glomerular nephritis associated with periarteritis nodosa, all also having vascular lesions of the periarteritis nodosa in the kidney. This confirms the frequently reported association of the two diseases.

Routine examination of all sections of all organs, with special emphasis on the small vessels, revealed an occasional arteriole showing the changes of periarteritis nodosa in the liver, colon, adrenals, brain, bladder, ovaries, kidney, and heart. In the latter two organs the lesions were equivocal. All lesions resembled the early stage of periarteritis nodosa with fibrinoid necrosis of the media and polymorphonuclear inflammatory response. Few eosinophils were present in any of the lesions except in the aneurysm. The most advanced lesion at the left superior cerebellar artery showed necrosis of the wall but no evidence of repair of previous lesions.

In this patient the association of several disease processes, that have been theoretically linked in their pathogenesis, provokes the supposition that they have a common etiologic basis. Periarteritis nodosa, chronic glomerular nephritis, allergic asthma, and multiple allergic idiosyncrasies have all been included under allergic disorders. Rich [4] demonstrated the lesions of periarteritis nodosa after serum sickness

[2] HARRIS, A. W.; LYNCH, G. W.; and O'HARE, J. P.: Periarteritis nodosa. Arch. Int. Med. 63: 1163–1182, June 1939.

[3] RALSTON, D. E., and KVALE, W. F.: Renal lesions of periarteritis nodosa. Proc. Staff Meet. Mayo Clin. 24: 18–27, Jan. 19, 1949.

[4] RICH, A. R.: Role of hypersensitivity in periarteritis nodosa as indicated by 7 cases developing during serum sickness and sulfonamide therapy. Bull. Johns Hopkins Hosp. 71: 123–140, Sept. 1942.

and hypersensitivity to sulfonamide. Kallós and Kallós-Deffner [5] (quoted by Rich) made postmortem histologic sections in 21 patients with asthma; one showed periarteritis nodosa and another demonstrated panarteritis obliterans.

Rheumatoid arthritis, which is often linked to an allergic disorder similar to those previously mentioned was produced by Selye et al.[6] in 1944 by overdoses with corticosterone acetate in rats; this was frequently associated with Aschoff-like lesions and occasionally by periarteritis nodosa. This finding is especially valuable in the use of adrenocorticotrophic hormones in the treatment of rheumatic arthritis.

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[5] KALLÓS, P., and KALLÓS-DEFFNER, L.: Die experimentellen Grundlagen der Erkennung und Behandlung der allergischen Kranheiten. Ergebn. d. Hyg., Bakt., Immunitälsforsch. u. exper. Therap. 19: 178–307, 1937.

[6] SELYE, H.; SYLVESTER, O.; HALL, C. E.; and LEBLOND, C. P.: Hormonal production of arthritis. J. A. M. A. 124: 201–207, Jan. 22, 1944.

# Isolation of Three Salmonella Species of Group C in One Case of Salmonellosis[1]

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LOUISE M. JOHNSON, *M. T.*
DONALD G. WETHERBEE, *Captain, MC, U. S. A.*
DWIGHT M. KUHNS, *Colonel, MC, U. S. A.*

THE isolation of more than one type of *Salmonella* from the same patient has been reported on a number of occasions, but recovery of multiple species is nevertheless unusual. Hormaeche, Peluffo, and Allepo [2] isolated *S. sp.* (Type Derby), *S. sp.* (Type Newport), and *S. sp.* (Type Montevideo) from a child affected with gastroenteritis. This appears to be the only previously reported patient in whom 3 *Salmonella* organisms were simultaneously implicated. Cernozubov, Filipovic, and Stavel [3] have reported 12 cases in which *S. typhi* and *S. enteritidis* were recovered from the same patient. The same investigators have also found two instances in which *S. paratyphi B* and *S. typhi* were isolated from patients and one instance each in which *S. sp.* (Type Senftenberg), *S. sp.* (Type Derby), and *S. choleraesuis* (var. Kunzendorf) were found in combination with *S. typhi.* Edwards and Bruner [4] have described multiple infections in fowls, and in 1946 Bruner and Joyce [5] reported 9 instances of double infection, but none with more than 2 serologic types. Other writers have reported isolated cases of double infection.

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[1] Fourth Army Area Medical Laboratory, Fort Sam Houston, Tex.

[2] HORMAECHE, PELUFFO, and ALLEPO. Quoted in Edwards and Bruner.[4]

[3] CERNOZUROV, FILIPOVIC, and STAVEL: Quoted in Edwards and Bruner.[4]

[4] EDWARDS, P. R., and BRUNER, D. W.: Occurrence of multiple types of paratyphoid bacilli in infections of fowls, with special reference to two new Salmonella species. J. Infect. Dis. 66: 218–221, May–June 1940.

[5] BRUNER, D. W., and JOYCE, B. J.: Salmonella types encountered by 15th Medical General Laboratory. Am. J. Hyg. 45: 19–24, Jan. 1947.

## CASE REPORT

A 25-year-old medical officer was admitted to Brooke Army Hospital on 1 September 1948 with nausea, vomiting, abdominal cramps, and diarrhea of 6 hours' duration. A month previously he had been hospitalized in El Paso, Tex., for diarrhea and vomiting, which subsided after 3 days without a specific etiologic diagnosis having been made. A year previously he had had a similar attack for which he had not been hospitalized. His sister-in-law died a year previously of amebiasis, and the patient was in frequent contact with her two children, both of whom also had amebiasis.

On the day before admission the patient had indulged in unaccustomed strenuous physical exercise, during which he perspired profusely. On admission to the hospital, he was trembling, appeared acutely ill, and was dehydrated. His temperature was 102.4° F. and his pulse was 120. He was vomiting frequently and passing loose stools containing blood and pus. His leukocyte count was 12,500, with 94 percent polymorphonuclear leukocytes. He was treated with saline-*d*-glucose infusions and sedatives, and the acute febrile episode of nausea, vomiting, and diarrhea subsided after 8 days. Stool examinations on admission revealed no amebas or *Shigellae*, but *Salmonellae* were present. As a result of this finding the patient was given 1 gram of streptomycin 3 times daily and 2 grams of sulfasuxidine every 4 hours for 2 weeks. *Salmonellae* continued to be present in his stools for several months, although his symptoms completely subsided following treatment.

## DISCUSSION

Three species of *Salmonella* (*S. sp.* (Type Bareilly), *S. sp.* (Type Oranienburg), and *S. sp.* (Type Montevideo)) were recovered from the patient's stools in the hospital. The antigenic components of these organisms are shown in table 1. It is possible experimentally to transform *S. sp.* (Type Oranienburg) to *S. sp.* (Type Montevideo) [6] and it is interesting to speculate whether this could have occurred in vivo. A summary of the organisms isolated in the hospital is shown in table 2. On only one occasion were two species recovered from the same specimen. On this occasion 6 separate colonies were picked, and studied serologically. Of these, five were *S. sp.* (Type Oranienburg), and one, *S. sp.* (Type Montevideo). It is probable that had previous specimens been studied in more detail, multiple species might have been isolated. The question of the pathogenicity of these organisms

[6] BRUNER, D. W.: Personal communication.

has naturally arisen, in view of the patient's clinical recovery while still harboring the organisms. It is perhaps significant that the patient's immune response, as measured by the development of agglutinins against these organisms, was not striking (table 3).

TABLE 1.—*Antigenic components*

| Salmonella sp. type | O factors | H factors |
|---|---|---|
| Oranienburg | VI, VII | mt— |
| Bareilly | VI, VII | y 1,5 |
| Montevideo | VI, VII | gms— |

TABLE 2.—*Summary of organisms isolated from stools in hospital* [1]

| Date reported: | *Salmonella sp. type* |
|---|---|
| 2 September 1948 (admission specimen) | Bareilly |
| 13 September | Montevideo |
| 20 September | No pathogens |
| 29 September | Oranienburg |
| 8 October | Oranienburg |
| 11 October | Oranienburg |
| 8 November | Oranienburg |
| | Montevideo |
| 29 November | Oranienburg |
| 27 December 1948 to 25 January 1949 | No pathogens |

[1] Blood culture on 21 October revealed no bacteria.

TABLE 3.—*Agglutination reactions*

| Patient's serum [1] | *S. typhosa* "O" | *S. typhosa* "H" | *S. paratyphi* | *S. schottmuelleri* | *S. sp.* (Type Oranienburg) (stock) | *S. sp.* (Type Oranienburg) (patient's) | *S. sp.* (Type Bareilly) (stock) | *S. sp.* (Type Bareilly) (patient's) | *S. sp.* (Type Montevideo) (stock) | *S. sp.* (Type Montevideo) (patient's) |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 Sept. 1948 | 80 | 160 | 40 | 80 | 0 | 80 | 0 | 40 | 0 | 40 |
| 9 Nov. 1948 | 320 | 640 | 160 | 640 | 0 | 0 | 0 | 40 | 0 | 0 |
| 27 Dec. 1948 | | | | | 0 | 20 | 0 | 0 | 0 | 20 |
| 26 Jan. 1949 | 320 | 320 | 80 | 160 | 0 | 0 | 20 | 0 | 0 | 0 |

[1] Patient received triple typhoid vaccine on 1 November.

Jager and Lamb [7] studying 8 patients with sporadic infection with *S. suipestifer* and *S. sp.* (Type Oranienburg) found that in 6 the patient's serum agglutinated the isolated organisms in dilutions ranging from 1:160 to 1:1280; and in 2 the patient failed to develop

[7] JAGER, B. V., and LAMB, M. E.: Sporadic infections caused by Salmonella suipestifer and Salmonella oranienburg. New England J. Med. 228: 299–305, Mar. 11, 1943.

agglutinins. Although our patient had a titer of 1:40 against *S. sp.* (Type Bareilly), 1:40 against *S. sp.* (Type Montevideo), and 1:80 against *S. sp.* (Type Oranienburg), these titers are of doubtful significance because the titers dropped to lower levels or became negative in subsequent specimens. Jager and Lamb also found that their two strains of *S. sp.* (Type Oranienburg) were lethal when injected intraperitoneally into mice. All 3 of our strains failed to produce death in mice when injected intraperitoneally in doses of up to 9 million organisms.

In vitro studies were performed with each of the three *Salmonella* strains for sensitivity to penicillin, streptomycin, bacitracin, polymyxin, aureomycin, and chloramphenicol using the tube dilution method, FDA broth [8] as a medium, and complete inhibition after 24 hours as the end-point (table 4). On the basis of these tests, it is possible that polymyxin or chloramphenicol might be clinically useful. Stansly, Shepherd, and White [9] found susceptible strains of gram-negative bacteria inhibited by concentrations between 0.5 and 16 micrograms per cc. On this basis our *Salmonella* strains, two inhibited by 0.78 and one by 3.12 micrograms per cc., could be classified as sensitive. Blood levels between 30 and 100 microgram per cc. are obtainable with doses of 2 to 4 grams of chloramphenicol daily. During the time the patient was harboring *Salmonellae* we did not have sufficient quantities of either of these antibiotics for a therapeutic trial.

TABLE 4.—*Antibiotic sensitivity*

| *Salmonella sp.* type | Penicillin | Streptomycin | Polymyxin | Bacitracin | Aureomycin | Chloramphenicol [1] |
|---|---|---|---|---|---|---|
| | *Units* | *Units* | *Micrograms* | *Units* | *Micrograms* | *Micrograms* |
| Oranienburg | 1 | 10 | 3.125 | 250 | 50 | 10 |
| Bareilly | 1 | 10 | .78 | 250 | 50 | 5 |
| Montevideo | 1 | 10 | .78 | 250 | 50 | 5 |

[1] If 50 percent of growth (measured turbidimentrically) of the control is taken as a criterion of sensitivity, lower figures for sensitivity to chloramphenicol are obtained.

## SUMMARY

*S. sp.* (Type Oranienburg), *S. sp.* (Type Bareilly), and *S. sp.* (Type Montevideo) all belonging to the *Salmonella* Group C containing somatic antigens VI and VII, were isolated from a single patient. Serologic studies indicate that the patient made a poor immune response to these organisms, as measured by the development of agglu-

[8] Food and Drug Administration Manual; Vol. I, Tests and Methods of Assay for Certification of Antibiotic Drugs, 1949. p. 2.

[9] STANSLY, P. G.; SHEPHERD, R. G.; and WHITE, H. J.: Polymyxin; new chemotherapeutic agent. Bull. Johns Hopkins Hosp. 81: 43–54, July 1947.

tinins. This raises the question of the pathogenicity of the organisms, as does the fact that none of the three species was pathogenic for mice. In vitro sensitivity, studies indicate possible sensitivity to polymyxin and chloramphenicol, but not to penicillin, streptomycin, bacitracin, and aureomycin.

# The Mobilization of the Medical Supply and Equipment Industry

ERNEST T. KRETSCHMER, *Captain, U. S. A. F. (MSC)*

SUCCESS in modern warfare depends on efficient mobilization of economic resources. If we become involved in another major war, the efficiency with which we mobilize our manpower, productive facilities, and natural resources will be decisive in determining the outcome.[1] The great European powers entered World War I with huge and magnificently equipped armies but with sufficient economic reserves to support those armies for only a few months. It was late in 1915 before effective mobilization of the national economies was inaugurated. By the time the United States entered the struggle, there was a great deal of British and French experience in economic and industrial mobilization available for our guidance. Our people did not seem willing to accept this advantage, however, and we learned our lessons the hard way, wasting billions of dollars and millions of irreplaceable man-hours in misguided efforts to produce military equipment in great volume. Time did not permit us to correct our initial errors and the United States came to the end of the First World War still unable to supply its troops with more than a fraction of the material requirements.[2]

*Planning between the wars.*—Fortunately, the Government and industrial leaders realized the errors into which our unpreparedness in planning had led us. It was resolved that the United States should never again fall into the same state of economic unpreparedness, and Congress and the Armed Forces made active efforts to remedy our shortcomings. The amended National Defense Act of 1920 provided an outline under which economic mobilization, procurement, and procurement-planning could be accomplished.[3] By its provisions, the

[1] BALDWIN, H. W.: Price of Power. (Published for the Council on Foreign Relations) Harper & Brothers, New York, N. Y., 1947. Chap. 11.

[2] Industrial College of the Armed Forces: Economic Mobilization. Washington, D. C., 1948. p. 10.

[3] Ibid., p. 11.

Assistant Secretary of War was assigned the "supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision for the mobilization of matériel and industrial organizations essential to wartime needs." [4]

The administration organization for the accomplishment and supervision of Army Medical Department procurement planning was established on three levels: Office of the Assistant Secretary of War, Office of the Surgeon General, and the depots of the Medical Department. On 25 October 1921, a procurement division was established in the Office of the Assistant Secretary of War, consisting of a current supply branch and a planning branch. For the purpose of preparing plans for industrial mobilization, the latter branch was divided into allocation, labor, finance, foreign relations, and transportation and storage sections.[5]

In the Office of the Surgeon General, the next echelon of administrative organization was established. Here, in June 1922, a procurement planning section was set up in the finance and supply division, and was charged with the collection of information and compilation of data pertaining to sources of supply.[6]

In the field, the administrative organization of procurement planning was controlled by the location of Medical Department depots and was effected, to a lesser extent, by the establishment of War Department Procurement Districts, within the framework of which procurement planning was performed. The supply arms and services, however, were authorized to establish their own Nation-wide organization, grouping two or more War Department districts into one district and thus reducing the number of field offices. The Medical Department established four procurement districts, in each of which a procurement planning office was included. Personnel devoted to procurement planning in the field were also engaged in current procurement, except in the New York General Depot where personnel were assigned exclusively to procurement planning.

With the administrative organization and the personnel described, the Medical Department sought to plan its procurement for the next war, and thus avoid the delays which hampered World War I efforts. The purpose of this planning was to ascertain both the requirements for another conflict, and the manufacturing facilities from whence they could be obtained. To the Office of the Surgeon General was assigned the former, and to the field offices, the latter tasks.

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[4] The National Defense Act, 4 June 1920, Section 5a (41 Stat. L. 764).
[5] Memorandum Orders No. 1. Office of the Assistant Secretary of War. 25 October 1921.
[6] Report of The Surgeon General, U. S. Army, to the Secretary of War. 1922.

After a field office had determined that a manufacturer was primarily concerned with producing medical supplies or equipment it would apply to the Assistant Secretary of War for an allocation granting to the Medical Department a virtual monopoly on the production of the manufacturer affected and authorizing a detailed production survey. The facility surveys were designed to secure information relative to the number, types, and condition of the buildings; the types and adequacy of transportation; the number, sex, and training of employees; the source and quantity of power employed; the types and sources of raw materials used; and the rate at which the manufactured item could be produced.

Based on facility surveys and computed requirements, schedules of production were prepared and presented to manufacturers for approval. These schedules obligated neither the Medical Department nor the manufacturer. By 1938 this task was virtually completed. Such model plans usually have an "Achilles heel," and this was no exception. If the procurement planning officer lacked interest or ability, the survey was hasty and superficial. If the manufacturer lacked enthusiasm for Government orders or was skeptical of procurement planning, not enough information could be obtained for an adequate survey. These difficulties were further increased by the scarcity of travel funds that prevailed during the two decades of peace and that greatly restricted the number of visits procurement planning officers could make to factories. It became necessary to resort to correspondence in many instances.[7]

*Supply experiences in World War II.*—Industrial mobilization plans were predicated on the belief that the transition from peace to war would be sudden, and that there would be an M-day when war would be declared. It was assumed that Congress would authorize the agencies of the War Department to contract directly with manufacturers allocated to them by the Assistant Secretary of War. In 1939, the need for more active preparation for war became apparent, but such preparations bore almost no relation to any previous planning. Steps were initiated to increase gradually the size of the Regular Army and of the National Guard. The items of medical supply necessary to meet these projects were purchased in the regular manner from the lowest bidder. No provision was made so that manufacturers allocated as sources for the items needed could be dealt with directly to facilitate purchase.

By the latter part of 1942, the Nation had gone a long way toward total war production, and the Medical Department began to feel the

[7] Much of the pre-World War II planning data was furnished by the Supply Office, Office of the Surgeon General, Department of the Army, Washington, D. C., 1950.

results of this production. By this time, the high procurement rate for tanks, guns, airplanes, and trucks purchased through high priority ratings took precedence over the rating of A–1–d assigned to the Medical Department for the purchase of medical supplies.

The shortage of such items as steel, aluminum, copper, and rubber adversely affected the availability of Army medical supplies because of their low-priority rating. These shortages were overcome by substitutions, some of which proved unfortunate. For example, in the case of sterilizers, the galvanized iron rusted rapidly and had to be replaced when Monel metal, stainless steel, or copper became available; the plywood food carts could not stand up long under the treatment such equipment is required to withstand; casters made of plastic materials were noisy and chipped easily, and eventually, all equipment with this type of wheel had to be replaced. Although stringent controls had to be exercised on the materials involved, insignificant short-run savings resulted in a subsequent duplication of effort and use of the originally specified material.

Priority regulations promulgated in 1941 and 1942 did little to alleviate procurement difficulties, except that, in August 1942, a rating of A–1–a was given for that portion of medical supplies destined for overseas (65 percent). The Controlled Materials Plan of 1 July 1943 was a plan to adjust requirements to supply, and its results were far superior to any previous plan. Under this plan contractors had no difficulty in obtaining allotments of controlled items and, consequently, deliveries could be scheduled with a fair degree of assurance.

The greatest hindrance to an earlier accomplishment of the supply program, aside from the late start, was the size of the requirements. No one in the purchasing office or industry could understand the need for so many surgical instruments. It is true that changes in the type of warfare, in the type of hospitalization, and the reduction in ship sinkings had much to do with altering the requirements, but the fact remains that the purchasing done in the latter part of 1942 was for 1943 requirements only. In many cases, the quantities purchased were sufficient to take care of 1943, 1944, and 1945. Drastic cutbacks were made all along the line, but by September 1944, some items, requisitions for which had previously been canceled, were being reordered. The computation of requirement appeared to be the most difficult task confronting the Medical Department. The lack of adequate specifications added to the general confusion. In many cases, applicable specifications did not exist. When they were available the data were extremely meager. Early in 1944 a program was inaugurated to bring all specifications up to date, including specific dimensions as well as drawings.

This experience made apparent the need for (*a*) an interservice medical procurement agency and (*b*) an interservice mobilization and planning agency.

### STATUTORY PLANNING

*National Security Act.*—After careful analysis of the successes and shortcomings of our military and economic mobilization in World War II, the National Security Act of 1947 (amended in 1949) gave us a plan for the coordination of those military and civilian elements relating to the national security which appeared to provide a firm basis for effective economic mobilization planning. By the terms of this Act, the National Security Council was charged with advising the President of the integration of domestic, foreign, and military policies.

*National Security Resources Board.*—The aforementioned Act also established the National Security Resources Board, primarily a policy-making agency, headed by a civilian chairman and including in its membership the Secretaries of State, Treasury, Defense, Interior, Agriculture, Commerce, and Labor. This board advises the President on the coordination of military, industrial, and civilian mobilization, and is charged with the responsibility for policies and programs for (*a*) manpower mobilization; (*b*) effective wartime use of resources and the balancing of military and civilian requirements; (*c*) united wartime Federal efforts in production, procurement, distribution, and transportation of military and civilian supplies; (*d*) the determination of the status of short wartime supply versus needs for manpower, resources, and productive facilities; (*e*) strategic and critical material reserves and their conservation; and (*f*) strategic locations of key industrial, civilian, governmental, and economic activities.

*The Munitions Board.*—This board is the top-level agency within the military establishment directly concerned with the procurement of matériel. It coordinates and arranges for the industrial support of the strategic and logistic plans prepared by the Joint Chiefs of Staff.

### MEDICAL PHASES OF PREPAREDNESS PLANNING

*Armed Services Medical Procurement Agency.*[8]—In World War II it became obvious that medical planning and procurement needs would be best served on a joint basis. Operating under the Directorate consisting of the Surgeons General of the Army, Navy, and Air Force, the Armed Services Medical Procurement Agency was established to: (*a*) procure medical items in accordance with the consolidated requirement of the three Departments; (*b*) catalog medical supplies and

[8] Formerly the Army-Navy Medical Procurement Office.

equipment; (*c*) prepare specifications for medical items; (*d*) perform developmental engineering in connection with medical items; and (*e*) formulate plans for industrialization and procurement in the event of a mobilization. Personnel for the Agency is provided by the three Departments. Chiefs of the Agency and of Divisions are rotated among the services, the tenure of each office being 2 years.

Because of its vulnerable location it would be quickly moved in case of another conflict. The reason for the present location is the proximity of the purchasing branch to the greatest concentration of suppliers.

With the establishment of the Industrial Mobilization and Procurement Planning Division within the Agency, the services now have the necessary tools to prevent the repetition of post- World War I and World War II policies in planning, purchasing, and related functions. This division (*a*) formulates, within the policies of the Munitions Board, plans for industrial mobilization and procurement in the event of mobilization, as prescribed by the Armed Forces, and (*b*) plans, directs, and coordinates the functions of the Operations Branch, Planning Branch, Materials Branch, and Survey Branch.

The more important functions of these branches are to: (*a*) review all current sources of medical supplies and prepare requests for tentative allocations for submission to the Munitions Board; (*b*) establish and determine quantities of end items required from each industrial establishment in the event of mobilization; (*c*) prepare estimates and make recommendations regarding reserves and stockpiles of items; (*d*) inquire into mobilization procurement of each item with special attention to such obstacles as governmental licensing of patents, and strategic dispersal of sources; (*e*) compile and/or compute reports on raw material, basic material, component parts, and packaging requirements for all end items; (*f*) accomplish surveys for both mobilization and current procurement purposes; and (*g*) search for potential sources of supply and submit recommendations regarding the desirability of obtaining capacity in industrial facilities.

*Determination of requirements.*—World War II requirements competed with priorities and shortages for top honors. In an effort to eliminate future troubles in this field, the Army and Navy have, since the war, supplied to the Industrial Mobilization Division requirement figures based on factors herein explained. These requirements are determined for each 90-day period of the first year following M-day, for 180-day periods for the following 2 years, and for each year following, up to the end of the mobilization planning period. The requirements are determined for the separate geographic areas involved and grouped for total requirements.

Requirements are divided into those for initial issue and those for replacement issue. Initial issue requirements are so phased in planning that they will be available on activation of the units concerned although issue is to be made at a later time. These requirements are based on allowances specified in Tables of Organization and Equipment for the type units, Tables of Allowances, and/or Medical Department Equipment Lists. Replacements issue requirements are determined by use of either normal or combat rates, depending on disposition of commitments of troop strength involved. The normal rate is derived from peacetime usage and is applied to troops not in combat. The combat rate is applied to troops in combat and is based on World War II issue experience as modified by the adoption of replacement or supplemental items and by changes in use-trends or therapeutic methods in the interim.

Requirement planning must also allow for acquisition of increased depot stocks to cover increased depot stock levels and to fill the extended supply pipeline resulting from active combat operations. Additional planning is likewise necessary to cover requirements of selected items whose demand is limited to certain areas because of diseases peculiar to those areas or by the type of warfare anticipated therein. With reference to civilian needs, the United States Public Health Service is responsible for its requirements. Inasmuch as the Armed Forces plan to allocate to themselves a maximum of only 50 percent of a factory's production, it is believed that the total civilian requirements will be adequately cared for with the balance.

*Plant surveys.*—The M-day plan is designed to effect an orderly distribution of contracts among all manufacturers in the event of mobilization, and it provides for close contact between the Armed Services Medical Procurement Agency and each industrial facility producing medical supplies. Initially, the Agency advises the Munitions Board of a manufacturer whose production capacity would be desired in the event of an emergency. The Munitions Board then designates the Armed Services Procurement Planning Officer as the "coordinator" if the Agency has the primary interest in the facility. The "coordinator" takes charge of all nontechnical administrative planning for use of the plant's production capacity in an emergency. The procedure of planning requires an interview with management of the plant, at which time the manufacturer is informed of the types and quantities of supplies needed from his plant in the event of an emergency. Management is asked to examine these requirements and then to estimate its production capabilities in relation to the requirements. It is asked to assume that there will be no expansion in the facility and that materials and manpower will be available.

*Tentative schedule of production.*—After the procurement agency has secured from the management the necessary capacity and product data, they prepare a tentative schedule of production and submit it to the company for acceptance. If accepted by the manufacturer, it is objectively determined that the quantity of supplies listed on the schedule can be obtained when required. On acceptance of this schedule, the company is asked to name selected subcontractors and suppliers that would be needed to accomplish the production and to estimate their requirements of tools, equipment, and materials that would be needed to achieve the production schedule. When completed, the schedule of production is forwarded to the Munitions Board for approval and record.[9] There is nothing in these schedules which bind either the Government or the firm contractually.[10]

*Stockpiling of strategic materials.*—The stockpiling of scarce strategic and critical materials for military and essential civilian use in a national emergency is essential. Huge-quantity production requires large stocks of the necessary raw materials. If the source of part or all of these raw materials is a foreign one, stockpiling is the only sure way to avert a wartime shortage.

*Status of planning.*—The Armed Services Medical Procurement Agency plans for the wartime procurement of all medical supplies and equipment used by the Armed Forces. Planning involves the determination of adequate future sources of supplies and materials. It also includes the function of establishing or taking measures to assure the availability of supplies and equipment. About 650 principal manufacturers of medical and dental supplies have been listed. New manufacturing facilities are continually being established and others continue to go out of business. These 650 manufacturers not only supply the Armed Forces in time of war, but must also continue to supply all the medical facilities and hospitals throughout the nation. At present they are also supplying large quantities of medicines to foreign countries.

The previously mentioned manufacturers will continue to require huge quantities of raw materials. The raw materials for those items required by the Armed Forces have been determined and the Armed Services Medical Procurement Agency has data on the amount of these materials that the manufacturer will require to supply the end items. This data is made possible principally by the establishment of bills of material for all items required. Bills of material are now on hand for about 80 percent of all important items.

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[9] Armed Services Medical Procurement Agency: Armed Services Medical Procurement Data. Brooklyn, N. Y., 1950. pp. 8–9.

[10] The Munitions Board: Allocation of Private Industrial Capacity. Operating Procedure Annex No. 47. Washington, D. C., 1948. p. 23.

Although most of the medical supplies and equipment used by the services are the same or similar to items used by civilian agencies, the military requirement often necessitates changes in the packaging and form of an item. These changes might be called military characteristics. The most common items used by the average person in his daily work will be available in time of war in sufficient quantity to military personnel. The principal shortages will be in those items that are not now readily available to the civilian population, and that are difficult to manufacture in large quantity. Insofar as items are concerned, more money will be spent for drugs and biologic products than for supplies and equipment.

## PROBLEMS BESETTING PREPAREDNESS PLANNING

*Foreign versus American surgical instruments.*—Prior to 1939, about 85 percent of the surgical instruments used in this country were imported from Germany. American jobbers were able to pay a 55 percent duty and still sell imported instruments for less than those made in this country. When importation of surgical instruments ceased in 1939, our manufacturers increased their production by inaugurating an extensive training program, adding new equipment, and working more than one shift. Some of the larger firms with more skilled artisans worked three shifts. Further expansion was accomplished by means of subcontracting. Although this resulted in appreciable increase in production, it was necessary to enlist the production facilities of silverware, jewelry, and cutlery manufacturers. On the whole, these newcomers joined the older firms in producing instruments in sufficient quantities, at the required time, and to specifications—in spite of shortages of critical basic materials and trained personnel.

With the return of the war-ravaged countries to production, it soon became evident that the importation of surgical instruments in quantity was only a matter of time. At present, the inflow is large, excellent in quality (though not necessarily superior to ours), and low in price. The net result to our manufacturers is a cutback in production and the layoff of skilled workers. The subsidizing of producers who are adversely affected by foreign imports, does not solve the problem. Only continued use of the skills of these trained men will guarantee the high production needs of another emergency. To the economist, the high tariff is a headache but to the mobilization officer it seems to be the only solution.

*Geographic concentration.*—In recent years, like industries have tended to concentrate in particular areas because of seaport facilities, concentration of population, transportation availability, national resources, or the presence of distribution facilities. The medical supply

industry is no exception. The dispersion of production facilities is a problem for the National Security Resources Board, and one that seems to have few avenues of satisfactory solution in a democracy. The only alternative seems to lie in the stockpiling of key items. Failing this, steps should be taken to license manufacturers in less concentrated areas, thus enabling them to take definite steps to produce these key items if and when the necessity arises.

# Assessment of Physical Fitness for Service in the British Army

A. E. CAMPBELL, *Colonel, R. A. M. C.*[1]

NO DISCUSSION of this subject is advisable without some review of the past. It is the large scale (now total) war which produces the time-demand-supply factors which have brought out and may continue to bring out the defects in organization and administration of medical assessment.

## BEFORE WORLD WAR I

Prior to World War I, recruiting was based on the excess of supply over demand. Between 1903 and 1911 rejections were 314.01 per 1,000 recruits examined and recruiting staff were experienced, working on a general service standard which in the majority of cases meant the exclusion of active disease. There was a follow-up of recruits of questionable quality. Results were seen in the high shooting and marching qualities of the British Expeditionary Force of 1914.

## WORLD WAR I

The *first phase* of recruiting was the effort to deal with 500,000 volunteers with the peacetime organization. Results were bad and subsequent discharges large although notes and instructions for medical examiners were issued. It is doubtful if these were even read and in any event an attempt was made to deal with too many men too quickly.

The *second phase* was the introduction of categories designated by letters and, by the end of 1915, medical boards consisting of a president and three or four members had replaced examination by individual civil medical practitioners. In spite of efforts to improve, the problem of the uniform standard remained great and there was much public criticism. In 1916 the system of lettered categories was

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expanded and subcategories provided for garrison and labor duties. Ability to march or walk 5 miles was used as a standard.

The *third phase* was brought about by (*a*) the wave of criticism of the manner, method, and standard of medical examination and classification which arose in the association with the increasingly difficult manpower situation, (*b*) a Military Service (Review of Exceptions) Act of Parliament, and (*c*) the critical state of the war. Parliamentary debate and examination resulted in the reconstruction of the Ministry of National Service and medical examination and reexamination passed to civil control by boards organized on a regional basis. On the necessity for a change the official medical historian of the time wrote: " * * * most of the trouble arose from the system of requisition and calling up of recruits and the fraudulent practices to escape military service. * * * Whatever else may have aroused popular feeling against the manner in which the Military Service Acts were being applied by the recruiting authorities and medical boards, the method of categorizing and the impossibility of maintaining a definite standard for each category were probably the chief causes of discontent." Official investigation showed that the margin of error in classification was not more than 0.5 percent of the total number of recruits classified and the impression was that the defects of the system and methods of medical assessment were accentuated if not exaggerated by the extreme pressure of circumstances and a vociferous minority of difficult cases.

As a *final* development recruits were placed in three grades. In Grade I were the men who had attained a normal standard of health and strength, were capable of enduring exertion suitable to their age, and were free from serious organic disease or deformity. Absence of disease and ability to withstand strain became standards of assessment. In Grade II were men able to stand a fair amount of physical strain and likely to improve under training. In Grade III were men unlikely to be fit for combatant service and suffering from defects or disabilities, the older men, and sedentary workers. History records that laborers might be placed in this group.

Certain diseases and conditions received historical mention having presumably been of sufficient importance or difficulty to the recruiting processes. When individual examiners were at work, hernia, varicose veins, defective vision, dental conditions, middle ear disease, "debility" and old age were mentioned as causes of rejection, revealing the fallibility of the initial examination. Absence of reference to "nervous disorders" is interesting. Later in the war a special review board rejected men already accepted, principally because of nervous disorders, tuberculosis of the lungs, and heart disease. A final review

of experience referred to the importance of dentistry, the significance of cardiac symptoms, and the introduction of lower visual standards.

### INTERWAR PERIOD

Recruiting for the Regular Army continued on conventional lines, the rejection rate being even higher than the prewar rate. The general service standard of fitness continued but a new mechanized class was separated from the "Horse and Foot" class and allowances were made for it. Considerable work was done in the enlistment of substandard recruits as special cases and their improvement by graduated training. This work in the assessment and treatment of remediable defects was the forerunner of that of the Physical Development Centers of World War II which did so much to increase physical efficiency in the wartime Army.

### WORLD WAR II

The Ministry of Labor and the National Service Medical Boards were at work assessing men in one of four grades approximating those of World War I. Normally men initially in Grade III were not inducted in the Army. The term constitution appeared as one of four characteristics for assessment, the others being ability to march, visual acuity, and keenness of hearing. There was no attempt at close definition of what was meant by "constitution," but it was described as freedom from organic disease, soundness of heart and lungs, and adequate mental and muscular development combining to produce in a soldier those qualities which would enable him to withstand severe strain. Ability to march was to be assessed on defects of locomotion not of structure.

The lettered categories were allotted by the Army authorities and corresponded generally with the original grades, i. e., A=Grade I=general service; B=Grade II=restricted service; C=Grade III=service at home. It was necessary to express the other characteristics and this was done by adding figures to these letters to express locomotor, visual, or hearing defects. Increasing manpower stringency, the employment of large numbers of more fit men in technical duties for which they were trained necessitated closer definition of defects influencing employment of the less fit. Men of 41 years and over had X added to their category between letter and number and limitation to temperate climates caused the addition of N. T. (nontropical) after the figure of the medical category.

*New developments.*—The time of maximum criticism may not be the period of maximum inefficiency. In World War I changes in the process of assessment of fitness occurred at a time when manpower

and general military conditions were critical. In World War II pressure of criticism arose from two new quarters both concerned with the mental side of human activity.

In 1942 a personnel selection procedure was introduced. Any deficiency in physical assessment was likely to be revealed by this procedure and particularly so in the stages of its development and the application of "press button" recording and sorting. For the first time, however, a full and comprehensive study of the soldier's work was undertaken and assessment of physical fitness consequently began to take proper place as a stage in the employment of manpower and the make-up of an Army. Pressure of criticism also came from the psychiatrists. The existing system of categorization did not in itself indicate a person's mental or emotional make-up and the war was not long in progress before the wastage from assessed psychiatric disabilities suggested the need for more accurate definition of these factors.

The British War Office was acquainted with work being done in Canada which resulted in the introduction of the PULHEMS system in 1943. Both medical and personnel aspects had been closely studied and selected groups of Army intake were examined according to the system. All aspects of the problem and the solution suggested by the PULHEMS system were considered. The British Army authorities had earlier decided that it was "both undesirable and totally impracticable to introduce a new system once war had started."[2] Not even such a system as PULHEMS could alter this decision.

## POST-ARMISTICE DEVELOPMENTS

In 1946 the devising of a new system of categorization was taken up by an Inter Service Committee and the present PULHEEMS system was officially adopted by the Army on 1 April 1948. The new system has also been accepted by the Royal Navy, Royal Air Force, and the Ministry of Labor and National Service. The title PULHEEMS pays tribute to its origin in the Canadian Army PULHEMS system. The purpose of the system is to assist in assigning men to the type of employment for which they are most suited. Early emphasis was placed on the necessity for a clear picture of a man's physique as it affected his functional ability as contrasted with the former methods of assessment based on anatomic abnormalities.

The qualities contributing to the final assessment were essentially the same as in PULHEMS. E. E. representing the need of Royal Navy and Royal Air Force for a statement for many of their tradesmen of the precise degree of visual acuity in each eye.

[2] FLETCHER, R. T.: PULHEEMS; a new system of medical classification. Brit. M. J. 1: 83–88, Jan. 15, 1949.

The *degrees of fitness* were in general in accordance with the following table which also shows their relation to climatic restriction.

| Degree | Functional efficiency | Climatic restrictions |
|---|---|---|
| 1 | Above average | None. |
| 2 | Average | |
| 3 | Moderate functional defect | |
| 4 | As P 1 | Service in temperate climate only. |
| 5 | As P 2 | |
| 6 | As P 3 | |
| 7 | Marked functional defect | Service in United Kingdom only. |
| 8 | Unfit for military service on existing standards. | |

This table is an oversimplification and it is necessary to study each "quality" in more detail.

P (Physical capacity).—Factors to be considered are age, build, strength, stamina and resistance to exposure. All degrees from 1 to 8 can be assessed.

U (Upper limbs).—Strength, range of movement, and general efficiency of upper arms, shoulder girdle, and neck are to be considered. In the case of assessment of both upper and lower limb functions, any pathologic condition will have a general constitutional effect and there is no need for specific climatic limitation and, therefore, for the use of degrees 4, 5, 6 under qualities U and L. The same considerations apply to H.

L (Lower limb).—The factors to be considered in assessment of degrees 1, 2, 3, 7, and 8 are strength, range of movement, and efficiency of feet, legs, pelvic girdle, and lower back.

H (Hearing).—A simple assessment of auditory acuity is supplemented by a guide to the effect of ear conditions on the quality P.

E E (Eyesight).—Uncorrected vision is classified in all degrees 1 to 8 together with corrected vision in each eye separately.

M (Mental capacity).—This quality is best assessed by the practical method of finding whether the man is able to understand his duties as a soldier. As such a method of assessment involving trial and error would be wasteful, the soldier's "M" assessment must be judged by consideration of: (*a*) his selection test results, (*b*) his record of school and of occupational progress, and (*c*) the impression he gives on personal interview.

S (Emotional stability).—The introduction of this quality into assessment practice and even more, its expression in degree was regarded doubtfully by many interested parties. This doubt found expression in the short-lived restriction on the recording of the S degree to medical documents.

On the assessments of both M and S qualities there is special limitation not found with other qualities. Degree 1 implies functional efficiency above average which it was considered extremely difficult to assess. This degree, therefore, is not used and 2 under M and S indicates normal or above. In M assessment there is no climatic limitation and degrees 4, 5, and 6 are not used therefore. The S quality has an

effect on climatic restriction but as limitation to a temperate climate on this account is unlikely to be compatible with a combatant role, degrees 4 and 5 are not used. Applicable degrees of qualities are shown in table 1.

TABLE 1.—*Applicable degrees of qualities*

| P | U | L | H | E | E | M | S |
|---|---|---|---|---|---|---|---|
| Degrees | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | | |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | | | | 4 | 4 | | |
| 5 | | | | 5 | 5 | | |
| 6 | | | | 6 | 6 | | 6 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| [1]8 | [1]8 | [1]8 | [1]8 | [1]8 | [1]8 | [1]8 | [1]8 |

[1] Unfit.

*Functional interpretation of degrees of each quality.*—Up to this point the discussion of the new system has tended to be at committee level far removed from the medical officer and his "case." To aid him a tabular guide shows 31 combinations of quality and degree. Little need be said about degrees 4, 5, 6 (climatic restrictions). U is related to weapon handling and L to marching (5 miles being the standard at different speeds) and standing (for 2 hours). Little is said on H and for E E standards which can be memorized are given for all degrees. Intelligence, once assessed, remains a constant factor and the separation is into those fit for full combat duty and specialist training, those fit for unskilled labor, and those of low mental capacity and unfit to bear arms.

The "S" quality calls for assessment of those (*a*) fit for full combatant duty anywhere, (*b*) with a history of emotional instability but fit for a nonfighting role anywhere, (*c*) with a history of instability but fit for a nonfighting role in a temperate climate, and (*d*) fit to perform Army duties adequately under living conditions favorable to the soldier in the United Kingdom. Much of the foregoing leads to the assessment of P. Fitness *after training* to withstand the full strain and fatigue and exposure of combat duty for long or short periods produces an assessment of P1 or P2. For P3 the standard is fitness for ordinary work and, therefore, for restricted service only.

*The influence of special conditions on assessment.*—The previous section deals with concepts and it may well be asked if more detailed guidance related to specific diseases or conditions is not essential. Official instruction warns the medical officer that he must use his own judgment and consider each case on its merits. Lengthy observation

(and therefore unemployment) is deprecated in minor disabilities and the prospect of useful employment within temperate climate or United Kingdom restrictions stressed. More detailed instructions linking disease histories to P are given for cardiovascular conditions, pleurisy with effusion, toxic goiter, cervical adenitis, renal calculus, diabetes mellitus, blackwater fever, sprue, heat hyperpyrexia, gastroduodenal disabilities, amputations, skin, ear, nose, throat, and eye diseases, and other morbid conditions, and finally problems of women are included in a section on gynecologic disorders.

*Documentation.*—A typical record of assessment is shown in table 2. The recorded degrees of the various qualities, 3 2 7 2 *1 1* 2 2 in the figure are known as the PULHEEMS code number or profile.

TABLE 2

| | P | U | L | H | E | E | M | S |
|---|---|---|---|---|---|---|---|---|
| 1919[1] | 3 | 2 | 7 | 2 | *1* | *1* | 2 | 2 |
| Ht. 72 | P | | | | | | | |
| C. P.[2] 2 | U | | | | | | | |
| Wt. 193 | L | Severe pes cavus with hallux rigidis, medical board 4-1-44 | | | | | | |
| | S | | | | | | | |

[1] Year of birth.
[2] Color perception.

*Correlation of PULHEEMS and employment.*—The standards on which a PULHEEMS assessment are based are constant throughout all corps of the Army except the women's corps which have a lower standard in P, U, and L. Because the functions of the corps vary, it would be uneconomical in manpower to require the same minimal PULHEEMS assessment for combatant, lines of communication, and base duties in all corps. Minimal requirements by corps and for employment within corps are tabulated in the official instructions. The application of the system is simplified by grouping the PULHEEMS assessment acceptable to each corps for each area of operations and expressing the result in a two-letter code known as a PULHEEMS Employment Standard (PES).

This code is interpreted as follows:

FE (forward everywhere): Employable at full combat duties in any part of the world.

FT (forward temperate): Employable on combat duties in any area in temperate climates only.

LE (lines of communication everywhere): Normally employed in lines of communication or base areas in any part of the world but may be employed in a forward area in any role which is not primarily a fighting one.

LT (lines of communication temperate): Normally employed in the lines of communication or base areas in temperate climates only; but may be employed in a forward area in any role which is not primarily a fighting one.

BE (base everywhere): Employable in the base area only in any part of the world.

BT (base temperate): Employable in the base area only in temperate climates.

HO (home only): Employable in the United Kingdom only.

*Administrative instructions.*—Earlier reference has been made to the place of PULHEEMS in the allocation of manpower. A special pamphlet is prepared for commanding officers who are informed that all officers should take an intelligent interest in the basic principles of the system which in its increased accuracy and scope will ensure fuller use of everyone's potentialities.

## DISCUSSION

It is perhaps unfortunate that the medical assessment of World War I should leave behind it a term of opprobrium, "C.3". As for the individual so also for the system, failure is remembered and yet World War II opened without any revolutionary advance in applying clinical appreciation and mensuration. There was greater definition and many would say that functional considerations were not neglected in these definitions. Initial examination by a board was maintained and there does not appear to have been the same difficulty as in World War I about the uniform standard.

As was inevitable, there was much reassessment in the service, and some criticism of the initial assessment by civilian boards but the small minority created and attracted much attention. Of one intake of over 5,000, 92 percent were in category "A" and over 6 percent in B.1. The efforts to use men of low grade of category or physique or stamina bulked large in proportion to numbers but pressure of manpower shortage was extreme. The demand for tradesmen and technicians increased the shortage of men for training, say, as infantry, in which good physique was essential.

The increased literature of medical assessment is interesting. The pamphlet of medical categories in World War II ran to 18 pages, Canadian PULHEMS to 128 plus 43 in tables of classification of Army duties and the PULHEEMS Medical and Administrative instructions run to 78. It is doubtful if the necessity for learning any assessment

system by reading and application is thoroughly appreciated. There is also need for knowledge of, and balanced sympathy with, the soldier in his work. These are sometimes difficult for the young medical officer to acquire.

It may also be asked if ordinary medical knowledge is sufficient to assess ability to withstand severe and prolonged strain or exposure, stamina, and liability to break down. The obvious negative answer reinforces the need for instruction of examining medical officers—a problem for the administrator and often an unwelcome imposition on the medical officer of a new attitude of mind. Reverting to the medical board and the work of a number of doctors whether they be military or civilian, the problem of the uniform standard is not necessarily solved by a new method of assessment unless it carries the calculation of ability much farther than seems possible at present. A review of PULHEEMS shows how often attention is turned back to the quality P so much of which was sought in the assessment of "ability to withstand strain" in World War I.

The need for inclusion of something of the nature of M and S qualities of PULHEEMS was undoubted but having qualified to be "qualities" what do we read about them? "With regard to M and S, degree 1 implies functional efficiency 'above average' which it is considered extremely difficult to assess; thus degree 2 under these qualities indicates normal or better."[2] The medical examiner in search of assistance may well ask if assessment is made any easier by making 1 into 2. There is some encouragement for the medical examiner handling difficult human material in the work which continues at the user end of the manpower problem into ability required in various employments. The association of workers on the various stages of allocation of manpower cannot but tend to mutual appreciation of margins of error and their reduction.

## SUMMARY

The history of the assessment of physical fitness for service in the British Army reveals increasing analysis with some recurrence of problems and terms. If medical examiners are not born they must be made—to get to know the practice of any system. Recent advances came from the Canadian PULHEMS system and, in their British form of PULHEEMS, emphasize functional capacity, peg mental factors and are linked to employment standards. There seems to be greater hope of proving norms and estimating capabilities if the critical attitude to previous systems continues along with the cooperation which produced PULHEEMS. The birth of a system essentially the same for Royal Navy, Army, and Air Force is in itself a notable event which may be of historic importance.

# About the Army Medical Service

## Additional Pay of $100

PAUL I. ROBINSON, *Brigadier General, MC, U. S. A.*[1]

THERE still appears to be some confusion among medical and dental officers, both active and inactive, as to who is eligible for the $100 a month additional pay. This has arisen because an essential change was made in Public Law 779, 81st Congress, to the basic law on this subject. Quoted are pertinent sections of applicable laws regarding the additional pay:

*Section 203, Career Compensation Act of 1949* (Public Law 351, 81st Congress)

(This section defines the term "commissioned officer" as used in this section and then goes on to prescribe that) "such officers * * * who heretofore, but subsequent to September 1, 1947, have volunteered and been accepted for extended active duty of one year or longer, or who may, prior to September 1, 1952, volunteer and be accepted for extended active duty of one year or longer; * * *.

"(b) In addition to any pay, allowances, special or incentive pays that they are otherwise entitled to receive, commissioned officers as defined in subsection (a) of this section shall be entitled to receive special pay at the rate of $100 per month for each month of active service: Provided, * * * Provided further, That the commissioned officers described in subsection (a) (3) of this section shall be entitled to receive the pay provided by this subsection only during periods of volunteer service: And provided further, That no commissioned officer as described in subsection (a) of this section shall, while he is serving as a medical or dental intern, be entitled to receive the special pay of $100 per month as is provided in this subsection."

*Public Law 779, 81st Congress*

"SEC. 2. Notwithstanding the provisions of section 203 of Public Law 351, Eighty-first Congress, commissioned officers of the reserve

[1] Personnel Division, Office of the Surgeon General, Department of the Army.

components called or ordered to active duty with or without their consent shall, if otherwise qualified, be entitled to the benefits of section 203 of Public Law 351, Eighty-first Congress."

"SEC. 5. No person inducted under the provisions of this Act shall be entitled to the benefits of the provisions of section 203 of Public Law 351, Eighty-first Congress."

Implementing these quotations from Statutes are Army Regulations 35–1120, and the following message which was dispatched by Chief, Office of Finance, Department of the Army on 21 September 1950:

"Under provisions of Pub[lic] Law 779, approved 9 Sep '50, physicians and dentists who are members of res[erve] components if otherwise qual[ified], are entitled to additional pay of $100. per month upon being called or ordered to AD [active duty] with or without their consent notwithstanding provisions of Sec 203 Career Compensation Act '49. Such pers[ons] on duty prior to 9 Sep '50 are entitled to additional pay from 9 Sep '50. Physicians and dentists inducted under provisions [of] Pub[lic] Law 779 approved 9 Sep '50 are not entitled to additional pay of $100. per month and remark of nonentitlement to additional pay in such cases will be entered in Item 33 of Mil[itary] Pay Record. Res[erve] off[icers] serving on AD as interns will not be paid additional $100. per month. AR 35–1120 is being amended accordingly."

The essential change is that officers now need not be "volunteers" to be eligible for the additional pay. There is no doubt that all Regular Army medical and dental officers are entitled to the $100. Questions arise concerning various categories of other officers, however, and an attempt will be made here to cover the facts regarding them.

*Interns*, either in military or civilian hospitals, are not eligible to receive the additional pay. When they finish their internship and remain on duty either voluntarily or involuntarily they are entitled to the $100 per month.

*Residents* are all Regular Army officers and, therefore, receive the additional pay.

*National Guard medical and dental officers* are considered to be members of the Reserve for purposes of their eligibility to receive the $100 as borne out by the hearings before the Armed Services Committee of the House of Representatives on Public Law 779, wherein the question was asked and answered in the affirmative.

*Officers brought on duty with units*, since the passage of Public Law 779, are eligible for the additional pay after date of Act (9 Sep-

tember 1950) whether or not they volunteered before being brought on active duty. Confusion arose in this respect because before passage of this Act, many had been ordered to duty; some had volunteered for pay purposes, others had not. Although no special policy has been published on this matter, it appears that those medical and dental officers who are members of Reserve components, if otherwise qualified, who volunteered and were accepted for extended active duty for 1 year or longer and who were ordered to active duty with their consent prior to 9 September 1950, are entitled to receive the additional pay from the date of entry on active duty. On the other hand, those medical and dental officers who did not volunteer and were brought on duty prior to 9 September 1950, are not entitled to the additional pay for any period up to 9 September 1950. Medical and dental officers who believe that they are entitled to the $100 per month for the period prior to 9 September 1950 must make application therefor, giving complete evidence of the fact that they volunteered for service before the date of alert of their unit. Such communications should be sent through command channels to the Office of the Surgeon General.

*Former ASTP and V–12 participants*, whether brought on duty with or without their consent, unless inducted by the Selective Service System, are entitled to the $100.

*Category officers* under SR 135–215–5, dated 27 May 1949, as amended, are all eligible for the additional pay since the passage of Public Law 779.

*Inducted physicians and dentists* are not eligible for the additional $100 per month either during the period they serve as enlisted men or later when they are commissioned and revert to duty as officers. Administratively, it may be necessary to designate a date or a specific period in the registration-induction process as a cut-off time, after which applications for commissions would not be considered. If this is done, the date or period will be widely publicized.

## WHY VOLUNTEER?

Physicians, dentists, and veterinarians who fall in priorities one and two of Public Law 779 are asking the question "Why should I volunteer?" This question is addressed to officers on active duty, to their seniors in civil life, to Members of Congress, to deans of professional schools, and to administrators of hospitals. Most young physicians in priority one are in residency programs. Their prime motive at present is to get as far along in that program as possible. Young dentists and veterinarians are beginning their practices, have made heavy monetary outlays for offices and equipment, and want to establish themselves firmly in their communities as rapidly as possible.

All know they will serve; all actually want to serve; but to volunteer they need to have the advantages pointed out to them because of the intensity of their prime motivations. There are good and substantial reasons why they should volunteer:

*$100 pay.*—None should jeopardize their right to this additional pay. This subject needs no further elaboration.

*Assignments.*—The Army, because of its almost world-wide service, cannot make commitments as to place of service. For the time being, however, the Army can give assurance as to type of assignment. If an applicant has had 2 or 3 years of training in a specialty, there are vacancies at present in all specialties to which he can be assigned. As time goes on and they are brought to duty in the priorities prescribed by Congress, many cannot be given assignments within their training sphere. Some may have to be given quick courses to qualify them for assignments outside their chosen fields. Others may have to be assigned in related fields. Volunteers, by virtue of being on the ground first, therefore stand the best chance of getting assignments to their professional liking. This will be an advantage to the applicant in the furtherance of his professional career.

*Opportunity for unusual service to the Nation.*—Those who have volunteered and are on duty when this article is published will have known the importance of their service in the preceding months. There will probably be no time which will offer more opportunity for public service than the months of October, November, and December, because the number of physicians and dentists on duty with the Army will be far below the minimum needed. As a consequence, the work to be accomplished will tax the capacity of everyone and the experience will be interesting and varied. Even in the early months of the new year there will be unlimited opportunities for all volunteers. There is nothing which renders more self-satisfaction than the knowledge that one is wanted and needed. Service rendered under such circumstances remains throughout life a source of pleasant reminiscences.

*Specialty credit.*—All who serve with the Armed Forces will have an opportunity to record their professional activities in a personal booklet which may be adjudicated by the specialty boards. There is good possibility that considerable credit will be given in this manner to apply on specialty accreditation. Those who volunteer and come on duty earlier, have a better chance for assignments within their professional spheres, and at the same time have a better chance of obtaining additional credit toward their specialty boards.

*Avoidance of registration.*—To some, the avoidance of registration alone is good and sufficient reason for immediately obtaining Reserve commissions and applying for active duty.

# Armed Forces Standards for Dental Examinations and Classification

As a basis for developing uniformity in dental forms, recording, and reporting procedures in the Army, Navy, and Air Force, there have been adopted Specifications for Conducting Dental Examinations and a Dental Classification of Individuals. It has long been recognized that this was a fundamental necessity toward future studies for standardization. This accomplishment will be of great assistance to the Dental Task Group of the Committee on Standardization of Medical Forms, Recording, and Reporting Procedures in the Department of Defense.

The following is the memorandum of the declaration of policy of the Department of Defense, which requires that they become effective in the Army, Navy, and Air Force.

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THE SECRETARY OF DEFENSE
WASHINGTON

*20 October 1950.*

MEMORANDUM FOR THE SECRETARY OF THE ARMY
THE SECRETARY OF THE NAVY
THE SECRETARY OF THE AIR FORCE

SUBJECT: Standardization of Dental Classification, and of Specifications for Conducting Dental Examinations

1. In order to effect uniformity in the nomenclature and definitions used in the Department of Defense with respect to dental examinations and classification, it is hereby declared to be the policy of the Department of Defense to use the following specifications and definitions:

*Specifications for Conducting Dental Examinations*

*Type 1—Ideal Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination; full mouth intraoral, periapical and posterior bite-wing roentgenograms; when indicated, percussion, thermal, and electrical tests, transillumination, and study models.

*Type 2—Routine Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination; posterior bitewing roentgenograms; periapical roentgenograms, when indicated.

*Type 3—Modified Routine Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination.

*Type 4—Screening Examination.*—Mouth mirror and explorer or tongue depressor examination; available illumination.

*Dental Classification of Individuals*

*Class 1.*—Individuals requiring no dental treatment.

*Class 2.*—Individuals requiring routine but not early treatment of conditions such as:

*a.* Moderate calculus.
*b.* Prosthetic cases not included in Class 4.
*c.* Caries—not extensive or advanced.
*d.* Periodontal diseases—not extensive or advanced.
*e.* Oral conditions requiring corrective or preventive measures.

*Class 3.*—Individuals requiring early treatment of conditions such as:

*a.* Extensive or advanced caries.
*b.* Extensive or advanced periodontal disease.
*c.* Pulpal or apical infection (root canal therapy).
*d.* Chronic oral infections.
*e.* Heavy calculus.
*f.* Cases requiring removal of one or more teeth or other surgical procedures not included in Class 5.

*Class 4.*—Individuals requiring essential prosthetic appliances, including:

*a.* Individuals with insufficient teeth to masticate the service ration.
*b.* Other individuals in need of an appliance essential to their duty.

*Class 5.*—Individuals requiring emergency dental treatment for conditions such as:

*a.* Injuries.
*b.* Acute oral infections (parietal and periapical abscesses, Vincent's infection, acute gingivitis, acute stomatitis, etc.).
*c.* Painful conditions.

2. It is desired that proposed regulations or directives relating to the above specifications and classifications be reviewed by the Dental Task Group of the Committee on Standardization of Medical Forms, Recording, and Reporting Procedures in the Department of Defense prior to publication, to insure common interpretation and unified procedures by the dental services of the three Departments.

[S] G. C. MARSHALL.

# Index of Tumor Chemotherapy

The National Cancer Institute announces the publication of a new report entitled "An Index of Tumor Chemotherapy." The 329-page monograph compiled by Dr. Helen M. Dyer, biochemist, represents the most comprehensive survey made to date of the literature on the results of treatment of tumors by chemical methods. The work was undertaken in order to provide cancer research workers with a single source from which the available information on this subject could be obtained. The result is a compilation of data from the chief reports on tumor chemotherapy published in the American, English, French, Japanese, German, Italian, Portuguese, Scandinavian, and Spanish scientific literature.

The four main sections of the report are (1) a historical résumé and explanatory introduction; (2) table of 5,031 chemotherapeutic tests classified according to chemical used; (3) an alphabetical index of the chemicals, keyed so that they may be instantly located in the table of chemotherapeutic tests; and (4) a bibliography of the 2,213 references from which the data were taken. The table of chemotherapeutic tests contains, for each chemical, data on the type of tumor, species and number of animals used, the dosage, number of treatments, route of administration, effect claimed, year the test was reported, and the reference.

Since the number of copies is limited, distribution to individuals will be confined chiefly to persons engaged in cancer research work. However, in order that everyone to whom the report may be of service may have an opportunity to use it, copies have been sent to all medical schools and other large scientific libraries in the United States and Canada, to many in foreign countries, and to several large city public libraries.

Requests for copies will be filled to the extent possible within the limitations imposed by the size of the edition and the relative needs of groups and individuals. Requests should be addressed to the Cancer Reports Section, National Cancer Institute, Bethesda 14, Maryland.—*National Cancer Institute of the National Institutes of Health, U. S. Public Health Service.*

# BOOKS RECEIVED

AN INDEX OF TUMOR CHEMOTHERAPY, A tabulated compilation of data from the literature on clinical and experimental investigations, by Helen M. Dyer, *Biochemist, National Cancer Institute, National Institutes of Health.* Distribution to persons engaged in cancer research or some allied field, free of charge, by Federal Security Agency.

MANUAL OF STANDARDIZED PROCEDURES FOR SPECTROPHOTOMETRIC CHEMISTRY, by Harold J. Fister, *Director: Viola Mae Fister Memorial Research Laboratory; Consulting Chemist: Reagent Chemicals Inc., and Standard Scientific Supply Corp.,* with a foreword by Margaret A. Baker, M. D. 500 pages; 126 calibration curves and 6 charts. Standard Scientific Supply Corporation, New York, N. Y., publisher, 1950. Price $30.

PHYSIOLOGY AND ANATOMY, by Esther M. Greisheimer, B. S. in Education, M. A., Ph. D., M. D., *Professor of Physiology, Temple University School of Medicine, Philadelphia; formerly Professor of Physiology, Woman's Medical College of Pennsylvania, Philadelphia; formerly Associate Professor of Physiology, the University of Minnesota, Minneapolis.* 6th edition. 841 pages; 478 illustrations, including 52 in color. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $4.

PRINCIPLES OF ORTHODONTICS, by J. A. Salzmann, D. D. S., F. A. P. H. A., *Associate Attending Dentist and Head of Orthodontics at the Mt. Sinai Hospital, New York; formerly head of the Dental Service at the New York City Vocational Schools; Associate Editor of the American Journal of Orthodontics; Editor of the New York Journal of Dentistry.* 2d edition. 887 pages; 533 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $15.

MCCLUNG'S HANDBOOK OF MICROSCOPICAL TECHNIQUE for Workers in Animal and Plant Tissue, by 35 authors, edited by Ruth McClung Jones, *Professor of Biology, Winthrop College, South Carolina.* 3d edition, revised and enlarged. 790 pages with 157 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price $12.

CANCER OF THE COLON AND RECTUM, Its Diagnosis and Treatment, by Fred W. Rankin, B. A., M. A., M. D., LL. D., Sc. D., F. A. C. S., *Surgeon, St. Joseph's and Good Samaritan Hospitals, Lexington, Ky.; Clinical Professor of Surgery, University of Louisville, Louisville, Ky.,* and A. Stephens Graham, M. D., M. S. (in Surgery), F. A. C. S., *Surgeon, Stuart Circle Hospital, Richmond, Va.; Associate Professor of Surgery, Medical College of Virginia.* 2d edition. 427 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $7.50.

CEREBRAL ANGIOGRAPHY, by P. Almeida Lima, *Professor of Neurology, Lisbon Faculty of Medicine; Head of the Neurosurgical Department, Hospital Julio De Matos, Lisbon,* with an introduction by Egas Moniz, *formerly Professor of Neurology, Lisbon Faculty of Medicine, Nobel Prize 1949.* Foreword by Sir Hugh Cairns, K. B. E., D. M., F. R. C. S., *Nuffield Professor of Surgery in the University of Oxford.* 221 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price $8.75.

THE MANAGEMENT OF OBSTETRIC DIFFICULTIES, by Paul Titus, M. D., *Obstetrician and Gynecologist to the St. Margaret Memorial Hospital, Pittsburgh; Consulting Obstetrician and Gynecologist to the Shadyside Hospital, Pittsburgh; Secretary of the American Board of Obstetrics and Gynecology; Member Reserve Consultants Advisory Board, Bureau of Medicine and Surgery, United States Navy (Captain, MC, USNR).* 4th edition. 1,046 pages; with 446 illustrations and 9 color plates. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $14.

THE MEANING AND PRACTICE OF PSYCHOTHERAPY, by V. E. Fisher, Ph. D., *Psychologist and Psychotherapist, formerly: Assistant Psychologist, Worcester State Hospital; Assistant Professor of Psychology and Director of the Mental Clinic, New York University, Washington Square College; Psychologist and Psychotherapist, Idaho State Hospital South.* 411 pages. The Macmillan Company, New York, N. Y., publishers, 1950. Price $5.

THE ESOPHAGUS AND PHARYNX IN ACTION, A Study of Structure in Relation to Function, by William Lerche, M. D., *Fellow, American College of Surgeons; Founder Member*

*and Honorary Member of the American Association for Thoracic Surgery, University of Minnesota, Minneapolis, Minn.* 222 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $5.50.

METHODS OF TISSUE CULTURE, by Raymond C. Parker, Ph. D., *Research Associate, Connaught Medical Research Laboratories, and Associate Professor of Experimental Cytology, School of Hygiene, University of Toronto,* with a chapter by Joseph F. Morgan, Ph. D., *Research Associate, Connaught Medical Research Laboratories, University of Toronto.* 2d edition. 294 pages; 113 illustrations. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price $7.50.

ACUTE HEAD INJURY, by Joseph P. Evans, M. D., Ph. D., *Associate Professor of Surgery; Director of Neurological Surgery, University of Cincinnati College of Medicine, Cincinnati, Ohio.* Publication Number 60, American Lecture Series. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.25.

RENAL DISEASES, by E. T. Bell, M. D., *Professor of Pathology in the University of Minnesota, Minneapolis, Minn.* 2d edition. 448 pages; 123 illustrations and 4 color plates. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $8.

FREUD: DICTIONARY OF PSYCHOANALYSIS, edited by Nandor Fodor, *Associate of the Association for the Advancement of Psychotherapy,* and Frank Gaynor, *co-author of the "Dictionary of Industrial Psychology,"* with a preface by Theodor Reik, *author of "Listening with the Third Ear."* 208 pages. Philosophical Library, New York, N. Y., publishers, 1950. Price $3.75.

SELECTED STUDIES ON ARTERIOSCLEROSIS, by Rudolf Altschul, M. U. Dr., *Professor of Histology, University of Saskatchewan, Saskatoon, Canada.* 182 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $5.50.

PATHOLOGIC PHYSIOLOGY: Mechanisms of Disease, edited by William A. Sodeman, M. D., F. A. C. P., *The William Henderson Professor of the Prevention of Tropical and Semi-Tropical Diseases, Tulane University of Louisiana School of Medicine; Senior Visiting Physician, Charity Hospital of Louisiana; Consultant in Medicine, U. S. Marine Hospital at New Orleans.* 808 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $11.50.

ON THE EXPERIMENTAL MORPHOLOGY OF THE ADRENAL CORTEX, by Hans Selye, M. D., Ph. D., D. Sc., F. R. S. (C), *Professor and Director of the Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada,* and Helen Stone, B. Sc., *Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, Canada.* Publication Number 74, American Lecture Series. 105 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.25.

CYTOLOGY OF THE HUMAN VAGINA, by Inés L. C. De Allende, M. D., *Chief of the Division of Endocrinology, Mercedes and Martin Ferreyra Institute of Medical Investigation,* and Oscar Orias, M. D., *Director, Mercedes and Martin Ferreyra Institute of Medical Investigation, Córdoba, Argentina,* with a foreword by Bernardo A. Houssay, M. D., translated from the Spanish by George W. Corner, M. D. 286 pages. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price $7.50.

THE PROSTATE GLAND, by Herbert R. Kenyon, M. D., *Associate Clinical Professor, Department of Urology, New York University, Bellevue Medical Center.* 194 pages. Random House, New York, N. Y., publisher, 1950. Price $2.95.

THORACIC SURGERY, by Richard H. Sweet, M. D., *Associate Clinical Professor of Surgery, Harvard University Medical School* Illustrations by Jorge Rodrigues Arroyo, M. D., *Assistant in Surgical Therapeutics, University of Mexico Medical School.* 345 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price $10.

EVALUATION OF INDUSTRIAL DISABILITY. Prepared by the Committee for Standardization of Joint Measurements in Industrial Injury Cases of the California Medical Association and Industrial Accident Commission, State of California. 89 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price $4.

MODERN TRENDS IN OBSTETRICS AND GYNAECOLOGY, edited by Kenneth Bowes, M. D., M. S. (Lond.), M. B., Ch. B. (Liverpool), F. R. C. S., *Obstetric Physician, St. Thomas's Hospital; Surgeon, Grosvenor Hospital for Women, London; Consultant Gynaecologist, S. W. London Regional Metropolitan Board; Examiner to the Examining Board in England; Sometime Examiner, University of London.* 778 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price $12.

RECENT ADVANCES IN OCULAR PROSTHESIS, by J. H. Prince, F. B. O. A., F. S. M. C., F. R. M. S., F. Z. S. A companion volume to "Ocular Prosthesis." 155 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price $4.

VERNAL CONJUNCTIVITIS, by M. N. Beigelman, M. D., *Clinical Professor of Surgery (Ophthalmology), University of Southern California School of Medicine; Senior Attending Ophthalmologist, Cedars of Lebanon Hospital; Attending Eye Pathologist, Los Angeles County Hospital*; with a foreword by Sir W. Stewart Duke-Elder, KCVO., M. A., D. Sc. (St. And.), Ph. D. (Lond.), M. D., Ch. B., F. R. C. S., Hon. D. Sc. (Northwestern). 430 pages. University of Southern California Press, Los Angeles, Calif., publisher, 1950. Price $6.

THE 1950 YEAR BOOK OF MEDICINE (May 1949–May 1950). Edited by Paul B. Beeson, M. D., J. Burns Amberson, M. D., William B. Castle, M. D., S. M. (Hon.) Yale, M. D. (Hon.) Utrecht, Tinsley R. Harrison, M. D., and George B. Eusterman, M. D. 819 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $5.

THERAPEUTIC RADIOLOGY, by George Winslow Holmes, M. D., *Radiologist, Waldo County General Hospital, Maine; Honorary Physician, Massachusetts General Hospital; Radiologist-in-Chief, Massachusetts General Hospital 1916–1941; Clinical Professor of Roentgenology, Emeritus, Harvard Medical School*, and Milford D. Schulz, M. D., *Radiologist, Massachusetts General Hospital; Instructor in Radiology, Harvard Medical School.* 347 pages; with 121 illustrations, 10 in color. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $7.50.

ENDODONTIA, The Clinical Pathology and Treatment of the Dental Pulp and Pulpless Teeth, by Edgar D. Collidge, B. S., M. S., D. D. S., LL. D. (Hon. Loyola), *Emeritus Professor of Therapeutics, Preventive Dentistry and Oral Hygiene, Chicago College of Dental Surgery, School of Dentistry, Loyola University, Chicago, Ill.; formerly Professor of Materia Medica, Pharmacology and Therapeutics of the School of Dentistry, University of Illinois.* 300 pages; 355 illustrations on 179 figures and a colored plate. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $6.

PLASMA CLOT SUTURE OF PERIPHERAL NERVES AND NERVE ROOTS; Rationale and Technique, by I. M. Tarlov, M. D., *Associate Professor of Neurosurgery, New York Medical College, New York City.* 116 pages; illustrated. Charles C Thomas, publisher, Springfield, Ill., 1950. Price $5.50.

SURGERY OF THE SHOULDER, by A. F. DePalma, M. D., *James Edwards Professor of Orthopedic Surgery and Head of the Department, Jefferson Medical College, Philadelphia; Attending Orthopedic Surgeon, Jefferson Medical College Hospital, Philadelphia; Attending Orthopedic Surgeon, Methodist Episcopal Hospital, Philadelphia; Attending Orthopedic Surgeon, St. Agnes Hospital, Philadelphia.* 438 pages; 454 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $17.50.

MEDICAL ENTOMOLOGY, With Special Reference to the Health and Well-being of Man and Animals, by William B. Herms, Sc. D., *Late Professor of Parasitology, Emeritus, University of California; one-time Lecturer in Tropical Medicine, University of California, Medical School, San Francisco; late Chairman, Division of Entomology and Parasitology, University of California.* 4th edition based on the book known as Medical and Veterinary Entomology. 643 pages; illustrated. The Macmillan Company, New York, N. Y., publishers, 1950. Price $9.

THE PERSON AS A NURSE (Professional Adjustments), by Florence C. Kempf, R. N., A. M., *Assistant Director of Nursing Service, University Hospitals of Cleveland, Ohio; formerly, Associate Director, Hartford Hospital School of Nursing; Assistant Director, Massachusetts General Hospital School of Nursing.* 236 pages. The Macmillan Company, New York, N. Y., publishers, 1950. Price $3.25.

CHEMISTRY VISUALIZED AND APPLIED, by Armand Joseph Courchaine, *Instructor in Biological Chemistry, Hahnemann Medical College, and Science Instructor, Hahnemann Hospital School of Nursing, Philadelphia; formerly Laboratory Supervisor, Human Serum Albumin Department, Sharp & Dohme, Inc., Glenolden, and Chemical Analyst, Allied Chemical & Dye Corporation, Barrett Division, Philadelphia.* Edited by M. Cordelia Cowan, with drawings by Richard Albany. 687 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publisher, 1950. Price $5.50.

THE PHYSICIAN EXAMINES THE BIBLE, by C. Raimer Smith, B. S., M. D., D. N. B. 394 pages. Philosophical Library, New York, N. Y., publisher, 1950. Price $4.25.

COMPARATIVE ANIMAL PHYSIOLOGY, by David W. Bishop, *Professor of Physiology, University of Massachusetts;* Frank A. Brown, Jr., *Professor of Biology, Northwestern University;* Theodore L. Jahn, *Professor of Zoology, University of California at Los Angeles;* C. Ladd Prosser, *Professor of Physiology, University of Illinois,* and Verner J. Wulff, *Assistant Professor of Physiology, University of Illinois;* edited by C. Ladd Prosser. 888 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price $12.50.

PRINCIPLES AND PRACTICE OF SURGERY, by Jacob K. Berman, A. B., M. D., F. A. C. S., *Associate Professor of Surgery, Indiana University School of Medicine; Associate Professor of Oral Surgery, Indiana University School of Dentistry; Chief Consultant in Surgery, Billing's Veterans' Administration Hospital, Fort Benjamin Harrison, Indiana; Director of Surgical Education and Surgical Research, Indianapolis General Hospital.* 1,378 pages; 429 illustrations. The C. V. Mosby Co., St. Louis, Mo., publisher, 1950. Price $15.

A TEXTBOOK OF X-RAY DIAGNOSIS, by British Authors, in Four Volumes, Vol. III. Edited by S. Cochrane Shanks, M. C., F. R. C. P., F. F. R., *Director, X-Ray Diagnostic Department, University College Hospital, London,* and Peter Kerley, M. D., F. R. C. P., F. F. R., D. M. R. E., *Director, X-ray Department, Westminster Hospital; Radiologist, Royal Chest Hospital, London.* 2d edition. 830 pages; 694 illustrations. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price $18.

THE DIAGNOSIS AND TREATMENT OF ENDOCRINE DISORDERS IN CHILDHOOD AND ADOLESCENCE, by Lawson Wilkins, M. D., *Associate Professor of Pediatrics, The Johns Hopkins Hospital, Baltimore, Md.* 408 pages; 411 illustrations, 6 in full color. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $13.

INTRODUCTION TO THE REGULATION OF BLOOD PRESSURE AND HEART RATE, by Corneille Heymans, M. D., *Professor of Pharmacology, University of Ghent (Belgium).* Publication Number 43, American Lecture Series. 60 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

RADIATION THERAPY IN THE MANAGEMENT OF CANCER OF THE UTERINE CERVIX, by Simeon T. Cantrill, M. D., *Director, Tumor Institute of the Swedish Hospital, Seattle, Wash.* Publication Number 55, The American Lecture Series. 196 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $5.

SURGERY OF THE EYE: Injuries, by Alston Callahan, B. A., M. S., (Ophth.), M. D., F. A. C. S., *Professor of Ophthalmology, Medical College of Alabama, and Director, Thigpen-Cater Eye Hospital, Birmingham, Ala.; formerly Chief, Eye Section, Northington General Hospital, Tuscaloosa, Ala.* 240 pages; 367 illustrations. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $11.

# BOOK REVIEWS

THE ORIGIN OF MEDICAL TERMS, by Henry Alan Skinner, M. B., F. R. C. S., *Professor of Anatomy, University of Western Ontario.* 379 pages. The Williams & Wilkins Company, Baltimore, Md., publishers, 1949. Price $7.

This thoroughly delightful book gives further evidence of the value and need for greater familiarity with the derivation of medical terms. When words originating from the same or cognate roots can be associated in the mind of the student of medicine the burden of learning a large vocabulary of special terms is not only lightened but becomes a pleasure in itself. The author has arranged the volume alphabetically rather than by subject giving cross references when indicated and this seems the most logical way of handling this type of material. Each entry is a little essay and short biographies of many men whose names have been attached to various medical terms have been sandwiched in with the other words. Derivations of words are often obscured by a veil of antiquity and the subject of false popular etymologies or of controversy. When a reasonable doubt exists the author explains the uncertainty and may even give more than one possible derivation for the same word thereby protecting the innocence of the novice. He never forgets that the history of a medical term is intimately linked with the history of medicine itself and thus one not only gleans much useful knowledge of words but of medical history as well.

I cannot help wishing he had given the derivation of the proper names included whenever such derivation was known but perhaps this was not done because of the infinitely greater confusion surrounding the derivation of most proper names. The interesting and little-known derivation of aspirin is not given although the word is listed. Possibly this is because it is a trade name. Some of the most interesting words in the language are or started out as trade names. Bedlam is traced back to Bethlehem but the derivation of Bethlehem, a proper name, is not given. It is more difficult to understand why in the case of a few words such as battery, luminal, and methodist no attempt at explaining the origin of the word is made. The uninitiated is left in doubt as to whether the first two syllables of hydrobromic and hydrochloric stem from the Greek hydor (water) or the related English hydrogen. The fact that a few words are out of their alphabetical place (lac and men-) indicates a haste in preparation not in keeping with the total effect.

The author has rendered a great service to students of medicine which I sincerely hope will not go unappreciated. The fact that this and other books and articles on this subject have appeared recently is an indication not only of the need for them but of a lamentable failure in the proper compilation of our medical dictionaries.—*Colonel W. G. Brandstadt, MC, U. S. A.*

THE EPITOME OF ANDREAS VESALIUS. Translated from the Latin with Preface and Introduction by L. R. Lind, Ph. D., *University of Kansas*, with anatomical notes by C. W. Asling, M. D., Ph. D., *University of California*, and a foreword by the late Logan Clendening, M. D. 103 pages of translation, and 28 pages of Latin Text. The Macmillan Co., New York, N. Y., publishers, 1949. Price $7.50.

Though only a schoolbook for the Sixteenth Century medical student, the Vesalian Epitome, or by its full title, De Humani Corporis Fabrica Librorum Epitome, has become for the twentieth century man of science a classical work of general interest. Since the original editions of this work disappeared from the bookshops long ago, it was decided at the time of the quadricentennial anniversary (1943) to publish an electrotype facsimile edition of the original issue of the work together with its English translation (the first one ever made), a short biography and evaluation of the author, and additional anatomic notes which bring the slightly obsolete Vesalian anatomic knowledge up to date. The English translation of the text is followed by a facsimile of the 14 folio pages of the 1543 Latin edition, reduced here to quarto size. This includes 11 anatomic full-page woodcuts, probably executed by Jan Stephan van Calcar, a contemporary of Vesalius.

The translation of any 400-year-old work into one of our modern languages is difficult, especially when the work deals with specific subject matter in a rapidly changing era of science. Some of us whose linguistic knowledge and eyesight suffice for such a job may find some enjoyment in comparing the translator's words with the reduced facsimile lines of the original and will surely disagree with Dr. Lind in many grammatic, syntactic, and semantic points. Those who are defective in Latin or in vision will have to be satisfied with the translation as it is, backed up by liberal general interpretation and modern terminologic notes at the end of each chapter. It appears that the translation was first completed and the anatomic notes attached later. The translated text would have gained much in meaning if the translator himself had known human anatomy and medical history, or if at least he had paid more attention to marginal Greek notes of Vesalius and to the modern anatomic notes of his collaborator. The publication is typographically correct and executed in excellent taste, as all monographs which form a number of Dr. Fulton's historic series of medical classics sponsored by the Historical Library of Yale Medical Library.

—*Lt. Col. C. F. Mayer, MC, A. U. S.*

PRINCIPLES AND TECHNICS FOR COMPLETE DENTURE CONSTRUCTION, by Victor H. Sears, D. D. S., *formerly Professor of Prosthetic Dentistry, New York University; Certified by American Board of Prosthodontics.* 416 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price $5.

This volume combines ideas from two earlier books, "Prosthetic Papers" and "Basic Principles in Dentistry," with additional material pertaining to technics and practice. From an elementary discussion of anatomy to directions for the maintenance of complete dentures, the text is well planned and presented. The chapters dealing with physics point out some of the mechanical problems involved, and show why and how basic physical laws should be considered and applied to full denture construction. The effects of forces, leverages, inclined planes, and other factors on denture stability are explained.

The subjects of tooth selection and occlusion are dealt with at some length. The author believes that the nonanatomic forms of teeth are best suited to complete denture stability and tissue preservation. His system of occlusion recognizes the value of bilateral and protrusive balance. In this respect his concept of occlusion represents a stand between the school which advocates the use of anatomic teeth with balance in eccentric positions and that favoring nonanatomic forms without balance.

Closing chapters present a practical approach to delivery and maintenance problems. The suggestions for adjustment, alteration, and refitting of dentures are of particular interest. An expanded glossary would help to orient the

reader who is unfamiliar with some of the terms which are not yet in common use. Likewise, additional illustrations would facilitate understanding such subjects as tooth forms and the recommended occlusal system.

*—Commander A. R. Frechette, DC, U. S. N.*

THE CAUSATION AND TREATMENT OF DELAYED UNION IN FRACTURES OF THE LONG BONE, by Kenneth W. Starr, O. B. E., E. D., M. B., B. S. (Syd.) M. S. (Melb.), F. R. C. S. (Eng.), F. A. C. S., F. R. A. C. S., *Surgeon, Sydney Hospital, New South Wales; Visiting Surgeon, Concord Military Hospital; Consulting Plastic Surgeon, Faculty of Dentistry, University of Sydney; Member of the Court of Examiners, Royal Australasian College of Surgeons; Lt.-Col. (R. of O.), A. A. M. C., late Officer Commanding Surgical Division.* 233 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., publishers, 1937. Price $9.

This timely and instructive monograph on the physiology and biochemistry of bone growth and repair was the Jacksonian prize-winning essay of the Royal College of Surgeons of England in 1944. The material consists of a critical review of the literature on bone growth and repair, with special reference to factors which result in delayed union. The study is amplified by the author's own investigation of bone repair through histopathologic sections made from biopsies of healing bone. The specimens were obtained from a group of 1,000 patients treated for fractures in a military hospital. About 450 of the fractures were the result of gunshot wounds. The arrangement of the subject matter is excellent and the vast amount of information and historic data has been condensed into easily readable form. The illustrations which consist chiefly of schematic drawings and photomicrographs are more than usually clear and informative.

Following the two sections on bone growth and fracture healing, the author discusses the causes and treatment of delayed union. In a somewhat sketchy but highly plausible manner, he presents general principles in fracture treatment designed to aid the normal process of bone healing. General nutritional factors, adequate immobilization, and rehabilitation are stressed. The indications for open reduction are clearly stated and multiple drilling of bone ends to hasten resorption of compact bone at the fracture site is emphasized. Intermittent passive congestion of the extremity following reduction is recommended to increase local blood supply and assist bone healing.

It is perhaps unfortunate that the author is so dogmatic concerning the treatment of open fractures. His practice of drilling bone ends in potentially infected areas and using wire or plate fixation with or without skin closure does not seem to be the safest procedure in most cases. In fractures associated with gunshot wounds, a policy of delayed primary closure and subsequent internal fixation in appropriate cases is to be preferred. It is surprising that there is little or no mention of the beneficial effects of supported weight bearing on delayed union. The author is also extremely conservative about the use of iliac bone grafts in conjunction with the open reduction of fractures and as a preventive of delayed or nonunion. The experienced orthopedic and traumatic surgeon will find much of academic interest and of practical value in the author's methods of fracture treatment. The student and the younger surgeon who may be called on to undertake the immediate operative treatment of battle casualties will do well to avoid the author's method of treatment of open fractures. This should be reserved for those with more mature judgment and applied only under exceptional circumstances.—*Col. E. A. Brav, MC, U. S. A.*

PRACTICAL NEUROLOGICAL DIAGNOSIS, With Special Reference to the Problems of Neurosurgery, by R. Glan Spurling, M. D., *Clinical Professor of Surgery*

(*Neurosurgery*), *University of Louisville School of Medicine, Louisville, Ky.*, 4th edition. 268 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $5.

The object of the author, as in previous editions, is to "present a simple account of the principles of neurological diagnosis * * * for students and practitioners who desire to become more proficient in the recognition of neurological disorders." The emphasis is on the practical aspects of the neurologic examination with special reference to the problems of neurosurgery. The neurologic examination is presented in a logical sequence, beginning with the importance of the history and general physical examination, followed by brief descriptions of the anatomy and physiology of the cranial nerves, cerebrum, cerebellum, and spinal cord. The anatomy and physiology are correlated with the mechanics of examining procedures, with many practical suggestions which should give the neophyte a basis for neurologic diagnosis and stimulate him to follow up his findings in a standard textbook for a more detailed analysis. This edition has been improved by the addition of a glossary of terms commonly used in neurology, by a revision of the chapter on the cerebellum, and by a brief discussion of the hypothalmus and the symptoms encountered in its disturbed physiology. There is an informative chapter on the spinal fluid. The chapter on roentgenology has been revised and includes sections on plain films, pneumoencephalography, ventriculography, and myelography. Unfortunately, no mention is made of arteriography or of electroencephalography. The general format and binding have been improved, and the illustrations are, in general, well selected.

—*Lt. Comdr. R. G. Berry, MC, U. S. N.*

THE PATHOLOGY OF INTERNAL DISEASES, by William Boyd, M. D., Dipl., Psych., M. R. C. P. (Edin.), F. R. C. P. (Lond.), F. R. C. S. (Canada), LL. D. (Sask.), D. Sc. (Man.), M D. (Oslo), F. R. S. (Canada); *Professor of Pathology and Bacteriology in the University of Toronto, Toronto.* 5th edition, thoroughly revised. 866 pages, with 391 illustrations and 11 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $11.

The fifth edition of this volume will be welcomed by pathologists and clinicians alike inasmuch as it is written to correlate symptoms with pathologic changes. The discussion of each disease includes a paragraph on the relation of symptoms to lesions thus making the book more useful and interesting to the internist. Books on surgical pathology are available to the surgeon and this book serves a similar purpose for the internist. The coverage is not as broad as in a textbook of pathology but includes, as the author states "* * * those diseases found on the medical wards of a teaching hospital or which would be included in a course of study for one of the higher examinations in Internal Medicine."

This edition includes a new brief chapter on diseases of the bones and joints of medical interest and new paragraphs on diffuse collagen diseases, the lupus erythematosus cell of disseminated lupus erythematosus, anemias of infection and of folic acid deficiency, histiocytic medullary reticulosis, temporal arteritis, Loeffler's pneumonia, anthracosilicosis, beryllium and bauxite pneumonitis, pulmonary moniliasis, idiopathic pulmonary hemosiderosis, the relation of the kidney to hypertension, renal lesions in diabetes, Kernohan's new classification of the gliomas, Ellis' classification of glomerulonephritis, cortisone in rheumatoid arthritis, and choline deficiency hypertension. Revisions have been made in the sections on the tetralogy of Fallot, the pathogenesis of coronary occlusion, bronchiectasis, poliomyelitis, Cushing's syndrome, multiple myeloma, emphysema, the apical distribution of pulmonary tuberculosis, and hepatitis and cirrhosis.

The discussion of jaundice includes a full-page chart illustrating the physiology of jaundice.

The illustrations are excellent and include 42 new black and white photographs and 3 new colored plates. Professor Boyd is one of the few physicians who can write entertainingly as well as authoritatively on medical subjects. His command of English, his knowledge of medical history and his frequent pertinent quotations make his books a pleasure to read.—*Col. H. R. Gilmore, Jr., MC, U. S. A.*

A GUDIE TO GENERAL MEDICAL PRACTICE, by Martin G. Vorhaus, M. D., *Attending Physician, Hospital for Joint Diseases, New York City.* 244 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price $3.50.

This book, intended for interns and the younger staff members of hospitals, presents the philosophy and personal outlook of a man who has been a general practitioner for 30 years. The problems faced on starting a general medical practice are discussed. The answers given and the discussion appear to be for rather immature readers. Much controversy can arise from Dr. Vorhaus' opinions, especially his regard of the internist and general medical practitioner as practically the same.—*Commander H. A. Lyons, MC, U. S. N.*

ELECTROCARDIOGRAPHY, Fundamentals and Clinical Application, by Louis Wolff, M. D., *Visiting Physician, Consultant in Cardiology and Chief of the Electrocardiographic Laboratory, Beth Israel Hospital; Associate in Medicine, Harvard Medical School.* 187 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $4.50.

Instruction in electrocardiography has been aided by the availability of many texts. It is refreshing to find in this small volume a different approach. This book, divided into two parts, is concerned with that portion of the electrocardiogram which is ventricular in origin. The auricular complexes, arrhythmias, et cetera, are not included. Part 1 presents some of the basic principles involved in the electrical phenomena associated with ventricular contraction. In orderly fashion the text progresses through a consideration of the normal and abnormal states, including bundle branch block, hypertrophy, and the effect of muscular injury. Diagrams amply complement the clear, simple text. Part 2, entitled Clinical Electrocardiography, presents a discussion of electrocardiograms which may be obtained in some of the common clinical conditions that involve ventricular muscle. The subjects of myocardial infarction, hypertrophy, and bundle branch block are discussed in some detail; other common conditions, to a lesser extent. Tracings are reproduced and analyzed with frequent reference to the pertinent discussion given in part 1. Controversial subjects as such are not discussed, but occasional statements and concepts which are not wholly accepted by all who are interested in electrocardiography are noted. The reproduction of many of the tracings might have been improved so that, for example, measurement of the duration of Q waves would be possible. The clear, simple style and manner of presentation of the subject is, however, of such general excellence, that the book is recommended as a valuable source of information for any practitioner desiring to know more about elementary electrocardiography.—*Col. J. S. Taylor, MC, U. S. A.*

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION, edited by Richard M. Hewitt, B. A., M. A., M. D.; A. B. Nevling, M. D.; John R. Miner, B. A., Sc. D.; James R. Eckman, A. B., M. A., Ph. D.; M. Katharine Smith, B. A.; Carl M. Gambill, A. B., M. D., M. P. H.; and Florence Schmidt, B. S. E. Volume XLI, 1949, published June 1950. 820 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., publishers, 1950. Price $10.50.

This volume, similar to the various specialty Year Books, is a compilation of selected material from the Mayo Clinic and the Mayo Foundation covering the period 1 December 1948 to 30 November 1949. It contains 746 papers, 108 of which are from the Proceedings of the Staff Meetings of the Mayo Clinic. As in previous volumes, this edition is divided into sections on diseases of the alimentary tract, genitourinary tract, ductless glands, blood and circulatory organs, skin (including syphilis), head, trunk and extremities, chest, brain, spinal cord, and nerves. There are sections on radiology, physical medicine, anesthesia, gas, intravenous therapy, and miscellaneous subjects. The sections on the alimentary tract and chest diseases are particularly comprehensive. This volume, covering a wide range of interests, is recommended to all medical officers in the Armed Forces.—*Lt. D. L. Andrus, MC, U. S. N.*

CLINICAL USES OF INTRAVENOUS PROCAINE, by David J. Graubard, M. D., *Assistant Visiting Surgeon, Cumberland Hospital; Assistant Visiting Orthopedist, Kingston Avenue Hospital, Brooklyn, New York; formerly Assistant Surgeon, Reconstruction Hospital Unit, New York Post-Graduate Medical School and Hospital, New York;* and Milton C. Peterson, M. D., *Visiting Anesthesiologist, Research Hospital, Kansas City, Missouri; formerly Anesthesiologist, New York Post-Graduate Medical School and Hospital; Associate Professor of Anesthesia, New York Post-Graduate Medical School, New York.* Publication Number 73, American Lecture Series. 104 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.25.

The authors of this book have probably had a wider, more varied, and more successful experience with the use of procaine intravenously than anyone else working in this field. There is an interesting commentary on events leading to the reintroduction of this method of treatment. Detailed points in technic for such disorders as traumatic pain, cardiac arrhythmias during anesthesia, the pain of acute poliomyelitis, postoperative pain, serum sickness, sensitivity, pruritus, and a miscellany of untoward conditions are concisely presented. The book gives the impression, however, that procaine given intravenously is a panacea for pain from any cause. Unfortunately this is not true. The authors fail to emphasize some of the inherent dangers accompanying the use of this drug intravenously. The pharmacologic background is inadequately covered.
—*Lt. (jg) R. W. Lykins, MC, U. S. N.*

A MANUAL OF CARDIOLOGY, by Thomas J. Dry, M. A., M. B., Ch. B., M. S. in Medicine, *Associate Professor of Medicine, University of Minnesota (Mayo Foundation); Consultant in Section on Cardiology, Mayo Clinic.* 2d edition. 355 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $5.

The second edition of this book on cardiology has accomplished well the aims of the author to "present again in as precise a form as possible the present-day concepts of cardiovascular diseases" and to "reflect the major advances which have been made since—the first edition." The subject matter is logically arranged, being introduced by a 6-chapter discussion of fundamental diagnosis and pathologic physiology and followed by 14 chapters dealing with the various abnormal conditions and their treatment. Peripheral vascular problems as such are not included.

The discussion of the individual clinical subjects is particularly worthy of comment. The Heart in Certain Metabolic States; Cor Pulmonale; Neoplastic Involvement of the Heart; Hypertensive Heart Disease; Cardiac Neurosis; Pregnancy; Anesthesia and Surgical Operations in Relation to Organic Heart

Disease are well covered in brief but adequate chapters. Disturbances of Rate, Rhythm and Conduction; Coronary Disease; and Congestive Heart Failure are expertly handled, stressing particularly diagnostic criteria and therapy. The chapter on rheumatic heart disease in its various complicating aspects is unusually well outlined. To note an unusual feature in classification, the endocarditides, disseminated lupus erythematosus, periarteritis nodosa, and diffuse scleroderma are included under a subheading entitled Diseases Apparently Related to the Rheumatic State. The 4-page coverage of Syphilitic Heart Disease probably reflects the current trend to regard the condition as one of the minor phases of present day cardiology. The chapter on congenital heart disease is the outstanding feature of the book. Here in outline form, considered by individual conditions, thoroughly briefed for quick reference, is an adequate starting point for the establishment of diagnosis. The remarks on developmental embryology, general symptomology, prognosis, and treatment are also helpful.

The manual is generously illustrated throughout with clear reproductions of pertinent roentgenograms, electrocardiograms, and schematic diagrams. The text is easily readable, terse, and well styled. In brief, this publication is pared to essentials yet complete, adequate, and as comprehensive as a manual of 355 pages can be. It is highly recommended as a reference text for those seeking a handbook on the subject.—*Col. C. L. Leedham, MC, U. S. A.*

UROLOGICAL SURGERY, by Austin Ingram Dodson, MC, F. A. C. S., Richmond, Va., *Professor of Urology, Medical College of Virginia; Urologist to the Hospital Division, Medical College of Virginia; Urologist to Crippled Children's Hospital; Urologist to St. Elizabeths Hospital; Urologist to St. Luke's Hospital and McGuire Clinic*, with 12 contributors. 2d edition. 855 pages; 645 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $13.50.

This second edition of the only comprehensive American reference work on urologic surgery should be a welcome addition to any urologic library. It is of interest not only to the urologist, but to the general surgeon required to perform urologic operations and to the urologic resident who should find it of inestimable value. This edition emphasizes progress in treatment and operative technics since the original publication in 1944. Reorganization of the text and the inclusion of more and better illustrations constitute a distinct improvement. Various sections have been ably contributed by collaborating specialists. This book does not deal with operative technical procedures alone, and therein lies its greatest merit. The sections on preoperative and postoperative care, fluid and electrolyte balance, blood transfusion, and treatment of shock with repeated references to diagnostic procedures are worthy of careful study by all because these factors are frequently more important for a satisfactory surgical result than the operation. The portion dealing with technical operative procedures includes indications for operation, choice of anesthesia, and probable surgical difficulties or accidents. Much of the newer controversial, technical procedures as ureterosigmoidostomy, et al., have been avoided.

—*Col. G. R. Hamilton, MC, U. S. A.*

NURSING CARE OF THE SURGICAL PATIENT (formerly Textbook of Surgical Nursing, 4th edition, by McFee and Keller), by John Pettit West, M. D., *Attending Surgeon, St. Luke's Hospital, New York; Assistant-Attending Surgeon, New York Hospital, New York; Assistant Professor of Clinical Surgery, Cornell University Medical College, New York;* Manelva Wylie Keller, B. S., R. N., *Formerly, Chief Operating Room Nurse, St. Luke's Hospital,*

*New York, and Anesthetist, St. Luke's Hospital, New York;* and Elizabeth Harmon, B. A., R. N., *Instructor in Surgical Nursing, Cornell University-New York Hospital School of Nursing, New York; Assistant Head, Surgical Nursing Service, New York Hospital, New York.* 5th edition. 500 pages; illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price $4.

The purpose of this revision was to emphasize the nursing duties in the care of the patient. The chapter on operating room nursing has been deleted since that is now considered to be a definite specialty. This is a concise, easily-read textbook which should aid the nurse in performing her duties more intelligently by combining the basic knowledge of common surgical diseases with an understanding of the principles of various diagnostic and therapeutic procedures. Review questions and references are given at the end of each chapter. The illustrations of various types of mechanical equipment used in caring for the surgical patient are excellent.—*Lt. E. M. Macha, NC, U. S. N.*

A Textbook of Gynecology, by Arthur Hale Curtis, M. D., *Emeritus Professor and Chairman of the Department of Obstetrics and Gynecology, Northwestern University Medical School; formerly Chief of Gynecological Service, Passavant Memorial Hospital, Chicago,* and John William Huffman, M. D., *Associate Professor of Obstetrics and Gynecology, Northwestern University Medical School; Attending Gynecologist, Passavant Memorial Hospital, Chicago.* 6th edition, 799 pages, with 466 illustrations, chiefly by Tom Jones, including 37 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $10.

This edition is in all respects similar to its predecessor. It has been completely reset with a bold faced and more readable type. An increase of about 50 pages has resulted more from changes in format than from new material. The chapter on embryology has been rewritten, and several new and pertinent illustrations added. Two short chapters on urethral conditions have, logically, been combined with the chapter on urinary tract problems. One of the most important features of this edition is the fact that the senior author has shared the responsibilities and work of revising the book with a confrere who can carry on the aims of the volume which he has thus far so ably achieved. With this collaboration of two authors, each an authority in his own right, we can, for years to come, look forward to further editions which will be dependable, authoritative, and readable.—*Commander R. E. Crowder, MC, U. S. N.*

Thrombosis in Arteriosclerosis of the Lower Extremities, Publication Number 41, American Lecture Series, by Edward A. Edwards, M. D., F. A. C. S., *Diplomate of American Board of Surgery, Clinical Associate in Anatomy, Harvard Medical School; Instructor in Surgery, Tufts College Medical School; Consultant in Peripheral Vascular Disease, Joseph H. Pratt Diagnostic Hospital and Hospital of the Massachusetts Soldiers' Home; Chief of Vascular Clinic, Boston Dispensary.* 74 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

This is a brief, concise, dramatic presentation of thrombosis of the lower extremities. The first 30 pages are devoted to etiology, pathology, clinical findings, and treatment. The remainder of the book reports 19 cases. The case presentations rather completely cover the gamut of symptoms and findings in thrombosis of the lower extremities and thereby offer a quick and ready reference to the busy practitioner.—*Col. A. E. White, MC, U. S. A.*

YOU AND YOUR HEART, A Clinic for Laymen on the Heart and Circulation, by H. M. Marvin, M. D.; T. Duckett Jones, M. D.; Irvine H. Page, M. D.; Irving S. Wright, M. D.; and David D. Rutstein, M. D., with foreword by Paul D. White, M. D. 306 pages; illustrated. Random House, New York, N. Y., publishers, 1950. Price $3.

This book reduces to simple terms the whole field of cardiovascular diseases. Written in an optimistic vein, the authors present their subject to the lay public in a clear, concise manner. Unlike some popular books on medical subjects, this one succeeds in portraying to the layman a basic understanding of heart disease without making him feel like an amateur diagnostician. Self-diagnosis is properly discouraged, emphasis being placed on the necessity for close supervision of any serious heart condition by a competent physician. The information presented should be a source of great comfort to all victims of serious heart disease. It should be even more valuable to those whose functional or minor organic disease keep them in a state of morbid invalidism through fear. The authors answer numerous questions simply, accurately, and at the same time explode many popular fallacies concerning diseases of the heart and blood vessels.—*Commander R. J. Whipple, MC, U. S. N.*

MODERN TRENDS IN ORTHOPAEDICS, edited by Sir Harry Platt, M. C., M. S., F. R. C. S., *Professor of Orthopaedic Surgery, University of Manchester; Consultant Adviser in Orthopaedics to the Ministry of Health; President, Société Internationale de Chirurgie Orthopedique et de Tramatologie.* 497 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price $35.

This British publication consists of 14 monographs or essays on the major subjects of orthopedics and traumatology, each written by a British authority. Its scope is limited by the editor in his introduction to "some of the problems, old and new, still to be faced." It was hoped that concise and critical evaluation of many of the newer forms of orthopedic treatment would be included but in general the authors confined their discussions to the history of their subjects, etiology, diagnosis, and pathology most of which is already contained in standard orthopedic texts. The inclusion of this material precluded more detailed and specific criticism of many new and controversial subjects. For example the first chapter, "Fracture Treatment," contains 17 pages on the biology of fracture healing, 8 pages of mechanics of fracture treatment, and less than 4 pages of modern trends in technic.

Girdlestone's chapter on tuberculosis of bones and joints contains an excellent discussion of lateral rachiotomy and other operations for decompression of the spine, but does not mention streptomycin. In fact the author's attitude toward chemotherapy in tuberculosis is very conservative. Osmond-Clarke's chapter on scoliosis is outstanding and should be required reading for orthopedic residents. Space does not permit discussion of each of the chapters but those on paralysis, vascular lesions, bone dystrophies, and chronic arthritis are among the best. In general this volume is desirable but not essential reading for those interested in orthopedics. The price of the volume seems to be higher than one would expect for a book of this size and binding.—*Lt. (jg) C. A. Mead, Jr., MC, U. S. N.*

PROCEEDINGS OF THE FIRST CLINICAL ACTH CONFERENCE. John R. Mote, M. D., Editor. 607 pages; illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1950. Price $5.50.

This book is the result of a conference sponsored by Armour and Company and held in Chicago in October 1949. It comprises the total of 52 individual pro-

ceedings. Of some importance to the average clinician are the papers which present the effects of ACTH on arthritis, gout, and allied diseases. This is primarily a reference work for those performing research involving ACTH. The illustrations are good.—*Lt. G. W. Hyatt, MC, U. S. N.*

SURGICAL TREATMENT FOR ABNORMALITIES OF THE HEART AND GREAT VESSELS, by Robert E. Gross, M. D., *William E. Ladd Professor of Child Surgery, Harvard University Medical School, Boston, Mass.* The Beaumont Lecture, Wayne County Medical Society, Detroit, Mich., 2d printing. 72 pages, illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

This classic little monograph represents the second printing of the Beaumont Lecture of 1946. It includes under one cover material which appeared originally in several journals and forms an authoritative review of the subject up to the time of its presentation by an outstanding surgeon and pioneer in this field. The subject matter is confined to congenital cardiovascular lesions amendable to surgical correction, and includes chapters on patent ductus arteriosus, defects of the pericardium, tetralogy of Fallot, right aortic arch, double aortic arch, anomalous right subclavian artery, and coarctation of the aorta. In several instances the discussion is enriched by case reports and personal experiences of the author. The photographs and drawings liberally illustrating the text are clear and well chosen. Because the text represents material originally presented 4 years ago, it is not surprising that more recent subjects, such as cardiac catheterization, commissurotomy in mitral stenosis, and the use of arterial grafts in coarctation of the aorta are not included.

This monograph will be of interest to surgeons, cardiologists, and pediatricians.—*Lt. Col. B. E. Pollock, MC, USA.*

NUTRITION IN HEALTH AND DISEASE, by Lenna F. Cooper, B. S., M. A., M. H. E., Sc. D., *Consultant Dietitian and Formerly Chief of the Department of Nutrition, Montefiore Hospital, New York City; Formerly Food Director, University of Michigan; Dean of School of Home Economics, Battle Creek College; Supervising Dietitian, U. S. Army, World War I; President, American Dietetic Association, 1937–38;* Edith M. Barber, B. S., M. S., *Writer and Consultant, Food and Nutrition; Food Editor, General Features Syndicate; Formerly Food Editor, New York Sun; Lecturer on History of Cookery and Public Relations for Home Economists, Teachers College, Columbia University;* and Helen S. Mitchell, A. B., Ph. D., *Dean of the School of Home Economics, University of Massachusetts; Formerly Principal Nutritionist, Office of Defense, Health and Welfare Services; Professor of Physiology and Nutrition, Battle Creek College.* Associate Author Henderika J. Rynbergen, B. S., M. S., *Assistant Professor of Science, Cornell University-New York Hospital School of Nursing; Formerly Director of Dietetics, American University Hospital, Beirut, Lebanon; Food Clinic Dietitian, Vanderbilt Clinic, Presbyterian Hospital, New York; Food Clinic Dietitian, Barnes Hospital, St. Louis; Nutritionist, Community Health Association, Boston.* 11th edition, revised and reset. 744 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $4.

The authors of this book are highly experienced and well recognized as authorities on the subject of nutrition in health and disease. The material is accurate and in accord with other experts in the field. The authors express themselves easily and simply. Through their writing they inspire an appreciation of the role that every nurse plays in teaching nutrition to her patient and his family. The book is physiologically sound and thoroughly practical in presenting up-to-date principles of nutrition and dietetics. This work will serve as an excellent

teaching tool in the curriculum of the student nurse or liberal arts student. The student will appreciate the well-selected review questions found at the end of each chapter. Many photographs, tables, and charts illustrate the subject matter. The book is convenient in size and weight, attractive in appearance, and the print is clear and easily read.—*Lt. M. O. Brandenburg, NC, U. S. N.*

THE MERCK MANUAL of Diagnosis and Therapy, A Source of Ready Reference for the Physician. 8th edition. 1,592 pages. Merck & Co., Inc., Rahway, N. J., publishers, 1950. Price $5.

The objective of presenting to the medical profession an up-to-date, authoritative handbook, stressing diagnosis and therapy, but including concise, yet comprehensive coverage of disease processes, has been admirably accomplished in the 1950 edition of the Manual. The material has been arranged in three parts, the first dealing with specific diseases or major symptoms; the second dealing with various immunization, bedside nursing, and laboratory procedures and reference tables; and the third consisting of the index. Ready access to the table of contents, Part I, is facilitated by a thumb index. A list of prescriptions completes each chapter. A number of prescribed products carry proprietary names and additional alternative proprietary preparations are listed in Part II. The Manual contains a wealth of current clinical information. The table of contents not only covers the field of general and internal medicine, but includes sections on eye, ear, nose and throat, genitourinary, neuropsychiatric, and dental disease, obstetrics and gynecology, and disorders due to physical and chemical agents. It should, therefore, serve as a ready and authentic reference for the busy intern, resident, or practitioner and, hence, may properly be included in both personal and hospital libraries.—*Col. J. O. Gillespie, MC, U. S. A.*

TEXTBOOK OF BIOCHEMISTRY, by Benjamin Harrow, Ph.D., *Professor of Chemistry, City College, College of the City of New York.* 5th edition. 609 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $6.

The author has brought his fifth edition up to date with many additions, and has rewritten portions of several chapters, without appreciably increasing the number of pages. A chapter on biologic antagonists which includes a short discussion of BAL has been added. The recent work on hyaluronic acid and hyaluronidase and its practical application is discussed. A section on chemotherapy deals with aureomycin, chloramphenicol, streptomycin, and tyrothricin as well as the chemistry of penicillin and the sulfonamides. The chapter on the chemistry of respiration has been expanded and gives a detailed explanation of the physiochemical aspects of the acid-base balance of the blood. A section on immunochemistry deals with the chemistry of the antigen-antibody reaction, histamine and antihistaminic agents, the Rh factor, hormones, carcinogenesis, and the effect of nitrogen mustard on neoplastic tissue. The chemistry of the nervous system and tissues of the body is elaborately discussed in two chapters. A valuable chart, "The Nutritive Value of Foods" is presented in the appendix as well as short discussions of vapor pressure, boiling point, osmotic pressure, *p*H, colloidal solutions, and surface tension. This book is simply written and complete. Although the clinical aspects of biochemistry are not emphasized, it is recommended particularly for the medical student, the internist, the clinical pathologist, and to any physician or allied scientist who needs a biochemical reference text.—*Lt. (jg) P. K. Hamilton, MC, U. S. N.*

LABORATORY MANUAL OF BIOCHEMISTRY, by Benjamin Harrow, Ph.D., Gilbert C. H. Stone, Ph.D., Harry Wagreich, Ph.D., Ernest Borek, Ph.D., and Abra-

ham Mazur, Ph.D.: *Chemistry Department, City College of the City of New York.* 3d edition. 149 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $2.25.

The purpose of this manual is to provide simple experiments for demonstrating certain phases of the subjects covered in the authors' text, or for use with any of the standard texts on biochemistry. It is written primarily for medical students. Questions are provided at the end of each experiment. Several experiments concerning more recent procedures such as the application of photo chemistry, and the uses of chromatographic analysis are included.—*Lt. (jg) P. K. Hamilton, MC, U. S. N.*

GERMAN AVIATION MEDICINE, WORLD WAR II, Volumes I and II. Prepared under the auspices of The Surgeon General, U. S. Air Force, Department of the Air Force. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price $8.50 for volumes I and II (must be purchased in sets).

These two volumes are the result of an organized effort by United States Air Force flight surgeons and allied scientists to collect, evaluate, condense, and integrate the mass of data representing the scientific accomplishments of Germany in aviation medicine during World War II. The 56 authors contributing to this work present a large amount of valuable data collected from universities, research laboratories, and military organizations that gave medical support to the Luftwaffe. In addition, the exposition is supplemented with references to research reports for the benefit of those who desire more detailed information. The scope of this work is wide and includes chapters on development and organization; aerodynamics and aviation medicine; high altitude physics and physiology; acceleration; vibration; problems of heat and cold; special senses (including the eye, ear, and mechanoreceptors); selection, training, and care of the flyer; emergency procedures such as air evacuation and air-sea rescue; blast effects; and the effects of air warfare on the civilian population. Within these chapters one finds such varied but pertinent topics as the physiology of the brain during anoxia, decompression sickness, explosive decompression, methods of increasing tolerance to acceleration, and man under gravity-free conditions. Aircraft designers, manufacturers, aviation medical specialists, and allied scientists should find these two volumes interesting and helpful.—*Commander N. L. Barr, MC, U. S. N.*

MEDICAL DISEASES OF THE KIDNEY (An Atlas and Introduction), by J. F. A. McManus, M. D., *Associate Professor of Pathology, The Medical College of Alabama, Birmingham, Ala.; late Beit Memorial Fellow in Medical Research, the University Museum, Oxford, England.* 176 pages; 100 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $6.

In the preface to this book the author states, "This is a pictorial introduction to the study of the diseased kidney. I have tried to orient the pathologist to the patient and the clinician to the pathology by an alternating discussion of clinical and pathological details." It is regrettable that he has made the orientation so difficult. The work presented is basic and fascinating, although the reader may have trouble at times in interpreting the writer's words. This is no ordinary discussion of renal disease, but is a description of the cellular and intracellular changes which occur in the component parts of the injured kidney. In order to do this, new laboratory technics have been employed to demonstrate the basement membrane, the Golgi apparatus, and tissue alkaline phosphatase. Each renal condition is discussed under the headings of both acute and chronic

renal failure in that the author believes that "these two headings comprise the majority of cases which clinician and pathologist alike encounter." The first third of the book is devoted to a discussion of the nephron in general, the other tissues of the kidney (blood vessels, connective tissues, and so forth) and the general reaction of the kidney to injury. The separate renal diseases, including "crush kidney," in their acute and chronic states are discussed in the remainder of the book.

It is indeed unfortunate that such a fine piece of work should be so mechanically poor. It is obvious that it was inadequately proofread, for hardly a page is free of some error in spelling or punctuation. At times these result in ambiguity. It also seems apparent that the book was not reviewed by any one outside the author's field, such as a general practitioner for whose class it is intended, or by one who did not have an intimate knowledge of the subject, for the author's phraseology and lack of consistency in terminology make digging out the desired information difficult. If carefully rewritten this timely book could be of great value to urologists and general practitioners.

One hundred illustrations, mostly photomicrographs, adequately illustrate the various points of discussion. A modest list of references is included, and the work is indexed.—*Commander W. S. Hansen, MC, U. S. N.*

MEDICAL DIAGNOSIS, Applied Physical Diagnosis, edited by Roscoe L. Pullen, M. D., F. A. P. C., *Professor of Graduate Medicine, Director of the Division of Graduate Medicine, and Vice Dean of the School of Medicine, Tulane University of Louisiana; Senior Visiting Physician, Charity Hospital of Louisiana at New Orleans; Consultant in Medicine, Veterans Administration Hospital, New Orleans, La.; Consultant to the Surgeon General, Department of the Army Washington, D. C.* 2d edition. 1,119 pages; illustrated with 601 figures, 48 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $12.50.

This excellent book on physical diagnosis covers a greater range than most volumes on the subject. It is not written especially for the internist, but is primarily for the medical student, the intern, and the general practitioner. The medical specialist will, however, find it of value as an up-to-date review of the abnormalities he should look for when he makes a general physical examination. No intern or young general practitioner will fail to benefit from a careful study of the 24 chapters written by 23 contributors (11 surgical and 12 medical) many of whom are authorities in their special fields.

The subtitle "Applied Physical Diagnosis," seems more appropriate than the title, "Medical Diagnosis," because the book does not especially deal with the concepts and syndromes of general diseases which so often concern the internist. This weakens the book as a text on medical diagnosis but does not detract from its value on physical diagnosis. The medical implications of certain abnormalities found in "surgical" gelds are not brought out, i. e. epistaxis (in rheumatic fever), Mikulicz's syndrome (in sarcoidosis), iridocyclitis (in rheumatoid arthritis), and cataracts and/or deafness (in congenital heart disease in an infant or child). These minor points may be important in leading the clinician to a diagnosis. The chapter concerning the skin and the one on oral diagnosis are both useful in this regard, however, pointing out the diagnostic significance of certain diseases and lesions. More about general and local signs often found useful in evaluating the seriousness of an illness, or which furnish clues to the diagnosis of an obscure condition should have been included. Perhaps an expansion of the first two chapters on the medical history and introduction to examination of the patient might be helpful for this purpose. Why must the beginner in medical diagnosis learn certain facts in the "school of hard knocks" when expe-

rienced clinicians can record them? Further, the recording of more correlative findings will stimulate and assist the beginner in the development of his own clinical acumen. The tyro of today often requests the laboratories to carry much of his burden.

As with any excellent book this one contains a few minor faults: On page 46 the name of Grey Turner is misspelled; in the discussion of jugular vein pulsation no distinction is made between deep and superficial jugular vein pulsations; no mention of the tophus of gout is found; no roentgenograms showing the lesions of pulmonary tuberculosis or lung carcinoma are included; no special mention of primary atypical pneumonia is made; the roentgenogram on page 334 depicting lobar pneumonia is not typical and is more suggestive of atelectasis; isolated dextrocardia is not mentioned under dextrocardia; the chapter on the extremities is weak in its section on arterial diseases but is superior on venous diseases; the chapter on electrocardiography is excellent for the advanced student, but for the beginner its mathematical approach is too formidable. A small diagram outlining the essential findings accompanying many of the roentgenograms would be helpful to the beginner.

Although each chapter is excellent, certain chapters not usually found in a book on physical diagnosis, such as those on the diagnosis of breast cancer, gynecologic and obstetric diagnosis, the infant and the child, the aged, the psychiatric patient, and the endocrine survey of the reproductive system are very useful. Many chapters have bibliographies which will prove helpful in directing the reader in further study. There is a good index.

—*Col. R. P. Johnson, MC, U. S. A.*

REGIONAL DERMATOLOGIC DIAGNOSIS, A Practical System of Dermatology for the Nonspecialist, by Ervin Epstein, M. C., *Consultant in Dermatology and Syphilology to the Oakland Area Veterans' Hospital and Mt. Zion Hospital; Consultant to the Tumor Board at the Highland-Alameda County Hospital; Co-Editor of "Dermatologica" ("International Journal of Dermatology"); Abstract Staff of "Excerpta Medica;" Diplomate of the American Board of Dermatology and Syphilology; Member of American Academy of Dermatology and Syphilology and of the Society of Investigative Dermatology; Former president of the San Francisco Dermatological Society; Secretary-treasurer of the Pacific Dermatologic Association; Secretary of the Section on Dermatology and Syphilology of the California Medical Association.* 328 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $6.

The author strives for simplicity by using the location of the eruption, which is one of the basic dermatologic diagnostic approaches, as the basis for his handbook. Because each of the 31 chapters deals with a certain part of the body, he has to repeat himself since many of the common dermatoses are widespread. This repetition is reflected again in the tables at the end of each chapter, wherein certain features of the diseases discussed in the chapter are listed. The author describes adequately the diagnostic aspects and comments briefly on the therapy of the common conditions which cover about 75 percent of the general dermatologic practice. The illustrations are excellent. Among the recent advances mentioned are ACTH therapy, Hargrave's cell in bone marrow, Moh's chemosurgical technic, and aureomycin and chloramphenicol. Three short appendixes include (*a*) the location of the lesions in the 20 most common dermatoses, (*b*) an outline for local therapy, and (*c*) the characteristic cutaneous lesions complicating internal diseases. In spite of its repetition and inadequate presentation of the cutaneous manifestations of systemic diseases this book gives the

student and general practitioner a clearly written and well-illustrated monograph on the diagnosis of common skin diseases—*Lt. (jg) S. L. Moschella, MC, U. S. N.*

PROGRESS IN BIOCHEMISTRY, A Report on Biochemical Problems and on Biochemical Research since 1939, by Felix Haurowitz, M. D., D. Sc., *Professor of Chemistry, Indiana University, Bloomington, Ind.* Interscience Publishers, Inc., New York, N. Y., publishers, 1950. Price $7.50.

This excellent review of biochemical progress is the first English edition following four German editions. The author has comprehensively reviewed the contributions of the past 20 years in biochemistry. The table of contents, the index, and the subdivisions of the text make any given item readily accessible. The style of the text is refreshing when compared to the usual book of this type. Some readers may object to the author's didacticism. This minor fault is more than compensated for by his brevity and clarity. There are excellent lists of references at the end of each chapter.

Chapter I is devoted to isotopes and should be of value to the reader who has limited time. The use of these substances in investigations is discussed throughout the book in appropriate places. The chapters concerning proteins and protein metabolism are interesting and pertinent. There is an excellent chapter on enzymes. Included here is the mechanism of blood clotting. The information presented on the anticoagulants is scant. Enzymes are elsewhere dealt with in appropriate sections. The volume will be helpful to physicians, biochemists, scientific investigators, and technicians.—*Lt. Comdr. H. A. Weiss, MC, U. S. N.*

THE CYTOLOGIC DIAGNOSIS OF CANCER, by the Staff of the Vincent Memorial Laboratory of the Vincent Memorial Hospital; a Gynecologic Service affiliated with the Massachusetts General Hospital, Boston, Mass.; the Department of Gynecology, Harvard Medical School. Published under the sponsorship of The American Cancer Society. 229 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $6.50.

This book is an excellent manual written to serve as a guide and reference to those engaged in the interpretation of cytologic smears. It is based on a wide experience of competent observers gained in the study of over 9,000 cases (about 27,000 smears) in the past 8 years. Included are chapters dealing with radiation changes, the respiratory tract, stomach, genitourinary tract, and peritoneal fluid. The book is lucidly written, profusely illustrated with photomicrographs, drawings, and color plates and is well arranged. Such a book has long been needed in the field of exfoliative cytology.

—*Lt. Col. J. W. Simpson, MC, U. S. A.*

THE MASK OF SANITY, An Attempt to Clarify Some Issues About the So-Called Psychopathic Personality, by Hervey Cleckley, M. D., *Professor of Psychiatry and Neurology, University of Georgia School of Medicine, Augusta, Ga.* 2d edition. 569 pages. C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $6.50.

This revised second edition written 10 years after the original publication is again superbly written in a delightful narrative and descriptive style. The subject material, the psychopathic personality, is portrayed in terms that make stimulating reading of a complex subject. In this edition, the author, while not formulating any profound new concepts, has combined his own research and clinical study of male and female patients with an extensive review of the literature. The book attempts to explain dynamically the behavior of the psychopathic personality. This interpretive material constitutes a distinct improvement over the first edition.

The first of the five sections briefly outlines the problem and difficulty in formulating diagnostic criteria. The psychopath cannot be classified with the psychoneurotic or the psychotic person. In a later section the author presents his criteria for diagnosing the psychopathic personality. He emphasizes the necessity of studying this group in their social setting. The term "psychopathic personality," has been interpreted by various psychiatrists to include a variety of personality defects that the author believes should not be included in this category. Section II contains a detailed description of several interesting cases and types. Section III, cataloging the material, includes (*a*) a brief historical discussion of early recognition of the psychopath by such men as Pinel and Rush; (*b*) dynamic formulations—notably those of Alexander; and (*c*) a comparison with the other disorders and the criteria necessary for the diagnosis of psychopathic personality. The author repeatedly observed that psychopaths do not manifest anxiety. Perhaps he referred to clinical free floating anxiety, as other observers have attributed the impulsive behavior patterns of some of their patients as a mechanism of discharging overwhelming instinctual anxiety. In Section IV, the author attempts to interpret the behavioral pattern of this clinical entity and proposes the term "semantic disorder" to describe a personality so damaged that experience as a whole cannot be grasped or used in its ordinary significance or meaning. He further relates that in this disorder we confront an ego that is neither broken nor outwardly distorted but of a substance that lacks ingredients without which normal function in major life issues is impossible. The last section titled "What Can Be Done" comprises a discussion of the legal barriers, the confusion and mental competence of the psychopath, and suggests that in evaluating the psychopath the question "of what he is capable and incapable?" should be asked, and proposes more liberal laws of commitment and provisions for hospitalization.

In addition there is an excellent bibliography comprising 226 references, a statistical report of admissions to a Federal hospital wherein he offers convincing data on the appalling prevalence of this disorder, and an interesting appendix describing methods of presentation of the psychopath in the literature 10 years ago. This excellent book is recommended for general practitioners, students, and psychiatrists.—*Commander C. H. Bagenstose, MC, U. S. N.*

MANUAL OF STANDARDIZED PROCEDURES FOR SPECTROPHOTOMETRIC CHEMISTRY, by Harold J. Fister, *Director: Viola Mae Fister Memorial Research Laboratory; Consulting Chemist: Reagent Chemicals Inc., and Standard Scientific Supply Corp.*, with a foreword by Margaret A. Baker, M. D. 500 pages; 126 calibration curves and 6 charts. Standard Scientific Supply Corporation, New York, N. Y., publisher, 1950. Price $30.

The increased scope of clinical chemistry and changing methods of analysis make this comprehensive manual of great value as an excellent compilation of procedures. Prior to its publication no recent comprehensive collection of analytical procedures adapted for photometric use was available. The scope of determinations encountered in either a clinical or research laboratory is amply covered by procedures for analysis of approximately 85 different substances. For many determinations alternate procedures are given, particularly for those substances utilizing different principles. In the determinaton of total protein, for example, four methods are given: biuret, tyrosine, Kjeldahl–Nessler, and nephelometric.

Each method is treated in a similar manner. The analytical principles are discussed briefly but adequately with minimum theoretical consideration. The type of sample, its collection, method of preservation, and substances which cause interference are outlined. Any special apparatus required is listed and necessary

precautions for cleansing or handling described. Preparation of reagents is given in detail as well as notes on preservation and stability. Normals for some reason do not accompany each procedure but follow in an appendix. Technic and calibration procedures are described in simple stepwise fashion. Modifications suitable for most commonly used photoelectric instruments are given. Each procedure in this manual is outlined with sufficient completeness to enable any technician who is at all familiar with photoelectric instruments to perform the determination.

The chemicals used in the preparation of the reagents are described in detail; the name, formula, purity, and brand are given. A notable exception is that the source of ampules of Evan's blue dye for blood volume determination is not given. This practice of specifiying brand names borders on commercialism in that chemical reagents meeting the specifications of the committee on analytical reagents of the American Chemical Society should be of sufficient purity to replace the brand names often mentioned despite the author's comments in the introduction.

The varied sources of procedures are from the world's scientific literature. The complete bibliography is a credit to the author's judgment and reflects the extent of his chemical research with its medical applications. His comments and criticism show wide experience. For example, in the Koppanyi barbituric acid procedure, the author comments, "This method is non-specific, neither very sensitive nor accurate and unsuitable for certain derivatives of barbituric acid. It is included here because of its widespread use. The best recovery possible is approximately 85 percent. For precise work, ultraviolet fluorescent methods should be used."

For a first edition it is remarkable that this manual is essentially free of errors.

In spite of the comment in the introduction that manufacturers of spectophotometers issue booklets suggesting technical information necessary to operate these instruments, a review or short chapter on photometric colorimeters and spectrophotometers would contribute to the completeness of this otherwise excellent manual.

This manual consists of pages inserted in a seven-ring loose binder. Although the publisher claims that such an arrangement will allow the owner of the manual to insert new procedures when available, it seems that a permanent binding would be better so that pages would not be lost.

The price of the work is higher than that of any comparable manual. Although the effort expended on the part of the author was tremendous, the high price may keep this publication from many laboratories. The original cost, however, will be more than offset by the time saved by the laboratory director who frequently peruses literature for more precise technical procedures and their adaptation to instruments at hand in his laboratory.

—*Lt. Comdr. H. C. Sudduth, MC, U. S. N.*

FRACTURES, by Paul B. Magnuson, M. D., F. A. C. S., *Professor of Bone and Joint Surgery and Chairman of the Department, Northwestern University Medical School; Attending Surgeon, Passavant Memorial Hospital and Wesley Memorial Hospital, Chicago;* and James K. Stack, A. B., M. D., F. A. C. S., *Assistant Professor of Bone and Joint Surgery, Northwestern University Medical School; Attending Surgeon, Passavant Memorial Hospital, and Cook County Hospital, Chicago.* 5th edition. 537 pages; 323 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1949. Price $7.

This edition brings up-to-date an excellent book on fractures, written to meet the needs of the man who first sees the fracture. A chapter on fundamentals

is short but excellent, stressing shock, immediate treatment, and estimation of disability. A new chapter on farmyard treatment of fractures is a timely addition for the modern physician who more and more has been relying on fancy apparatus and elaborate "orthopedic" tables in the treatment of fractures. The chapter on compound fractures reflects the experience of recent years. The principles of leaving wounds open if 6 hours have elapsed, the treatment of shock, antibiotic therapy, and the treatment of arterial spasms are emphasized. An excellent chapter on the pathology and repair of fractures is reproduced from the Outline of Treatment of Fractures, American College of Surgeons. Other chapters deal with anatomic mechanism and physical equipment in the reduction of fractures and equipment for treatment.

Following these basic chapters are specific chapters on various fractures of all bones of the body, excluding the jaw, stressing the simpler effective ways of treating the fractures, and the nonoperative method of treatment with traction suspension or plaster immobilization. Only the most essential operations such as that for a fracture of the neck of the femur are described. Applied anatomy of the spinal column and spinal cord, fracture dislocation of the spinal column, and fractures of the skull are described by Loyal Davis. Physical therapy and exercise in the treatment of fractures are discussed by John S. Coulter. —*Col. A. W. Spittler, MC, U. S. A.*

WILLIAMS' OBSTETRICS, by Nicholson J. Eastman, *Professor of Obstetrics, Johns Hopkins University, and Obstetrician-in-Chief to the Johns Hopkins Hospital.* 10th edition. 1,176 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1950. Price $12.50.

This text, well known for its comprehensive presentation of the principles and practice of obstetrics, has again been thoroughly revised to record the important advances of the past decade. The authorship has returned to the medical school in which it originated and retains in general its original distinguishing features. The organization into 10 sections and the rearrangement of the chapters with several changes in titles are logical and sound. The initial section and chapter presents some of the new material and serves admirably to orient the reader in the broad relationship of obstetrics to public health, to medicine in general, and to other closely allied fields. The long chapter on the toxemias has been rewritten and includes a new and simple classification of these disorders. An extensive section on hemolytic disease of the newborn by Dr. Milton S. Sacks is authoritative and up-to-date. Other major sections which have been rewritten deal with endocrinology, placental transfer, abortion, ectopic pregnancy, hydatidiform mole and chorionepithelioma, multiple pregnancy, diabetes mellitus, syphilis, pelvimetry, pelvic contractions, uterine inertia, forces concerned in labor, placenta previa, transverse presentation, analgesia and anesthesia, rupture of the uterus, postpartum hemorrhage, puerperal infection, and apnea neonatorum.

New illustrations include colored plates of the pelvic floor and an excellent portrayal of the Waters and Norton extra-peritoneal cesarean sections. Several commonly employed terms such as engagement, primigravida, primipara, multipara, toxemias of pregnancy, placenta previa, forceps delivery, and breech delivery which were previously confusing are defined and classified in accordance with an agreement arrived at in conference with three other authors of obstetrical texts. Readers would welcome similar efforts applied to such terms as abortion, immaturity, and prematurity.—*Commander E. B. Hopper, MC, U. S. N.*

SIMPLIFIED CHEMISTRY EXPERIMENTS, by Armand Joseph Courchaine, *Instructor in Biological Chemistry, Hahnemann Medical College, Philadelphia, Pa.; Science Instructor, Hahnemann Hospital School of Nursing, Philadelphia,*

*Pa.; formerly Laboratory Supervisor, Human Serum Albumin Department. Sharp & Dohme, Inc., Glendolden, Pa.; formerly Analytical Chemist, The Barrett Division, Allied Chemical & Dye Corp., Philadelphia, Pa.* Edited by M. Cordelia Cowan, illustrated by Richard Albany. 234 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1950. Price $2.80.

These experiments are designed to give the novice many of the fundamental chemical and physical facts of import in inorganic, organic, and physiologic chemistry. They are apparently designed for general technician training, as no attempt at specialization is made. To achieve this goal in a single manual designed for a time outlay of 124 hours is a monumental feat. Despite the necessity, therefore, of concentration on fundamentals only, the experiments proceed in an orderly and rapid progression, and are well integrated. Given competent supervision, the student should profit by the visual and mental stimuli occasioned by the outlined procedures. Especially noteworthy are the sections which explain (*a*) the metric system, (*b*) the arithmetic involved in the preparations of solutions, (*c*) ionization and electrochemistry, and (*d*) colloidal solutions and their behavior.

Certain clinical laboratory tests on blood, urine, and milk are included.

—*Lt. L. J. Bodenlos, MSC, U. S. N.*

WATER AND SALT DEPLETION, by H. L. Marriott, C. B. E., M. D., F. R. C. P., *Middlesex Hospital, London, England.* Publication Number 32, American Lecture Series. 80 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

This monograph presents a series of Croonian Lectures delivered before the Royal College of Physicians, London, in December 1946. Revisions have brought the material up to date. Because of their close association in metabolic processes, water and salt depletions are regarded by some writers as always occurring simultaneously, and as a result many patients have been subjected to physiologically unsound treatment. The author does not fall into this error but places water and salt depletions in three distinct catagories: (*a*) pure water depletion, (*b*) pure salt depletion, and (*c*) mixed water and salt depletion. By the use of charts and tables, a vast amount of information is clearly and concisely presented. The author being a physician, rather than a physiologist, presents the data from the clinical standpoint giving the diagnosis, causes, effects, treatments, and prevention of water and salt depletions. A bibliography containing 126 references is included.

—*Lt. B. F. Burgess, Jr., MSC, U. S. N.*

THE PHYSIOLOGY OF TISSUES AND ORGANS, An Introduction to the Study of Systematic Physiology, by Douglas H. K. Lee, M. D., M. Sc., D. T. M., F. R. A. C. P., *Professor of Physiological Climatology, The Johns Hopkins University, Baltimore, Md.; formerly Professor of Physiology, University of Queensland, Australia.* 159 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $4.

Compiled from carefully edited lecture notes for an undergraduate course this scant epitome of systematic physiology is reminiscent of the "College Outline Series" dear to the hearts of undergraduates at examination time. The limited scope and superficial treatment of the physiology of tissues and organs presented in this volume make it of doubtful use even as a review outline. As a textbook, it is without merit. The blood is discussed in 5 pages and the lungs in three-quarters of a page. The chapter on the embryo considered as an organ seems singularly out of context. Only one reference is given, and that appears in the

chapter on the aging of tissues. This chapter is inserted apparently as a philosophic afterthought, with little bearing on what has gone before, as the concluding chapter of part I devoted to the physiology of tissues. The illustrations are few but good; the typography is excellent.

—*Lt. Comdr. S. W. Handford, MSC, U. S. N.*

THE DIAGNOSIS OF SALMONELLA TYPES, by F. Kauffmann, M. D., *Chief, International Salmonella Center, State Serum Institute, Copenhagen, Denmark.* Publication Number 62, American Lecture Series. 86 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.25.

This handbook discusses the theory and methods followed in the serologic and biochemical classification of the organisms in the salmonella group. Clearness of concept is sacrificed to some degree by the brevity of the text, but adequate material is included to make the reader aware of the complexity of the subject. The diagnosis of all salmonella types is a special problem which can only be dealt with effectively by salmonella typing centers, and the average bacteriologic laboratory should be concerned with only a few of the more important types.

—*Lt. Comdr. W. W. Taylor, Jr., MSC, U. S. N.*

MANUAL OF RHEUMATIC DISEASES, by W. Paul Holbrook, M. D., and Donald F. Hill, M. D., *Tucson, Ariz.*, with the assistance of Charles A. L. Stephens, Jr., M. D. 182 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $4.25.

This manual presents a lucid description of the more common rheumatic diseases. The illustrations have been well selected. Because the rarer rheumatic diseases are not described and there is no documentation, much of the value is lost for those who desire to pursue their case studies further. The aspects of preventive therapy are well presented and properly stressed. Until such time as rheumatic diseases can be prevented every effort must be made to apply proper and adequate preventive therapy to avoid the crippling deformities. This manual will be of most value to the general practitioner and the medical student.

—*Lt. Col. I. H. Marshall, MC, U. S. A.*

PYE'S SURGICAL HANDICRAFT, A Manual of Surgical Manipulations, Minor Surgery, and Other Matters Connected With the Work of Surgical Dressers, House Surgeons and Practitioners, edited by Hamilton Bailey, F. R. C. S. Eng., *Surgeon, and Surgeon-in-charge of the Genito-urinary Department, Royal Northern Hospital, London; Senior Surgeon, St. Vincent's Clinic and the Italian Hospital; Surgeon, Consolation Hospital, Lambeth; General Surgeon, Metropolitan Ear, Nose, and Throat Hospital, London; Consulting Surgeon, County Hospital, Chatham, Potter's Bar Hospital, and Clacton Hospital; formerly External Examiner in Surgery, University of Bristol.* 16th edition, fully revised. 724 pages with 830 illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price $6.

This new edition of a surgical manual written principally for interns, residents, and general practitioners, covers a wide range of subjects each of which is deserving of a separate monograph. Chapters on such widely divergent topics as first aid, pre- and post-operative care, anesthesia, clinical laboratory methods, treatment of venereal disease, fractures and dislocations, and the minor surgical technic of all the surgical specialties, force the authors to be brief to the point of omitting even the highlights of their chosen subjects. An example of this sketchy organization is the 4-page chapter on the management of thyroid cases by the editor, in which Lugol's solution, thiouracil, and vitamin B in the early

preoperative treatment of the patient are mentioned, but propylthiouracil, methylthiouracil, and radioactive iodine are omitted. The only antibiotic recommended for various surgical infections is penicillin. This may stem from the unavailability of streptomycin, aureomycin, and other antibiotics in Great Britain. The authors have presented an incredible number of minor surgical methods and diagnostic procedures, which should be of great assistance to medical students and interns. Surgeons who have advanced beyond the intern level will find the treatment of any particular subject much too brief and lacking in the more recent advances to be of practical value.

—*Commander P. C. Guzzetta, Jr., MC, U. S. N.*

CONGENITAL ANOMALIES OF THE HEART AND GREAT VESSELS, by Thomas J. Dry, M. D., et al. *from the Mayo Clinic and the Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota.* Edited by Paul R. Cannon, M. D., *Professor of Pathology, University of Chicago School of Medicine, Chicago, Ill.* A monograph in American Lectures in Pathology. 69 pages; 80 illustrative plates of models in color, photographs and drawings. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $4.50.

This excellent concise and descriptive book is the outgrowth of the fine exhibit prepared by the authors for the centennial meeting of the American Medical Association held in 1947. The authors have portrayed by photographs of models, specimens, and drawings the structure of congenital heart anomalies. The more common clinical features of each anomaly are listed. Portraits of pioneer investigators in the field of congenital heart disease have also been included with short biographic notes.

—*Commander J. A. Grindell, MC, U. S. N.*

KINESIOLOGY, by Laurence E. Morehouse, Ph. D., *Associate Professor of Physical Education, The University of Southern California; Interim Chief, Performance Physiology Section, United States Air Force School of Aviation Medicine; and Formerly Research Fellow, Harvard Fatigue Laboratory;* and John M. Cooper, Ed. D., *Associate Professor of Physical Education, The University of Southern California; Formerly Associate Director of Physical Training, Army Air Forces Training Command; and Formerly Athletic Coach, University of Missouri.* 435 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $4.50.

This book was written mainly for students of athletics and physical education. The first half deals with the growth, development, and structure of the organs of locomotion and discusses the physiologic and mechanical features of their function. The second half is devoted to an analysis of the function of the locomotor system in each element of athletic activity under such headings as running, lifting, hanging, throwing, and swimming. Specific information, presumably of invaluable aid to athletic coaches, is given concerning the varied suitability of different body types for different purposes and how a person's strength may be increased by teaching him to use the synergistic action of related muscles. This book unfortunately loses much of its authority through the presence of numerous typographic errors and confused terminology.

—*Col. M. S. Thompson, MC, U. S. A.*

MANAGEMENT OF PERIPHERAL ARTERIAL DISEASES, by Saul S. Samuels, A. M., M. D., *Chief of the Department of Arterial Diseases, Stuyvesant Polyclinic Hospital, New York; Consulting Vascular Surgeon, Long Beach Hospital, Long Beach, N. Y.; Director and Attending Angiologist, Brooklyn Hebrew Home and Hospital for Aged, Brooklyn, N. Y.; Fellow in Surgery, New York*

*Academy of Medicine; Member of Committee on Surgery, New York Diabetes Association; Editor-in-Chief, "Angiology"; President, Angiology Research Foundation.* 345 pages; illustrated. Revised and enlarged from The Diagnosis and Treatment of Diseases of the Peripheral Arteries. Oxford University Press, New York, N. Y., publishers, 1950. Price $7.50.

This is the third book on this subject by the author and is the result of his personal experiences with thousands of cases in 25 years. About half of the book is devoted to thromboangiitis obliterans and half of the remainder discusses arteriosclerosis obliterans. The history, etiology, pathology, signs and symptoms, treatment, complications, and differential diagnosis are thoroughly and adequately covered. The author is an ardent advocate of the use of hypertonic saline solution in the treatment of occlusive vascular diseases but not many clinicians share his enthusiasm, nor will many men, particularly surgeons, agree with him in assigning a minor role to lumbar sympathectomy. His strong plea for conservative surgery in the management of gangrene in Buerger's disease should be heeded by all in view of the fact that it was necessary to perform only 4 major amputations in over 1,000 of his cases. The space devoted to illustrative case reports seems excessive.

The other disorders of the peripheral arteries are briefly, and in some instances only superficially, discussed. One glaring error appears on page 290. In discussing the causes of peripheral arterial embolism it is stated "over-enthusiasm in the use of *digitalis* to bring auricular fibrillation to normal cardiac rhythm has been a frequent cause of the detachment of emboli from the left auricle." The next sentence concerning the wisdom of converting auricular fibrillation to a sinus rhythm is open to debate. This volume does not add very much to the already voluminous literature on peripheral vascular diseases.

—*Col. E. M. Goyette, MC, U. S. A.*

TRANSACTIONS OF THE AMERICAN GOITER ASSOCIATION, 1949 Annual Session, May 26, 27, 28, Hotel Loraine, Madison, Wis. 460 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $10.50.

To anyone interested in diseases of the thyroid gland, including pathogenesis, diagnosis, and the newer forms of therapy, this volume is a welcome and valuable addition. In the investigative work reported, the research on exophthalmos and fat mobilization is the most thought provoking. There are also several interesting papers on antithyroid and thyroid hormonelike preparations. The place of radioactive iodine in diagnosis and therapy is discussed thoroughly. Of special interest is the round table conference on the present treatment of hyperthyroidism. Advocates of surgery, antithyroid drugs and radioactive iodine report their opinions. A symposium on carcinoma of the thyroid and its relationship to nodular goiter covers the subject so completely that no doubt is left in the mind of the reader as to the significance of nodules in the thyroid. There are also several case reports and papers on miscellaneous phases of diagnosis and pathology of diseases of the thyroid. Each paper is followed by a bibliography. There is no index but the volume is preceded by a list of contents. The paper and printing are of a quality that makes reading easy.

—*Commander E. P. McLarney, MC, U. S. N.*

EXHIBITIONISM, by N. K. Rickles, B. S., M. D., *Fellow of the American Psychiatric Association, Diplomate of the American Board of Psychiatry and Neurology, Senior Consultant at the Veterans' Administration Center, Los Angeles, Consultant in Psychiatry to the Office of the Surgeon General, Medical Department, United States Army, and Director of the Psychiatric*

*Center of Seattle.* 198 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $5.

In this concise, but comprehensive, nontechnical book Dr. Rickles has brought together his own experience with exhibitionists gained in the Behavior Clinic of King County (Seattle), Washington. He makes a praiseworthy effort to find the underlying psychopathology of exhibitionism and to remove the cause. This treatise should be of interest, not only to psychiatrists but to parents, sociologists, judges, and police officers.

Most cases of exhibitionism are the result of mental disorder, not of depravity. This type of behavior accounts for 20 to 35 percent of all sex offenders in various reports. Of these more than 70 percent reveal definite evidences of some mental disorder, ranging from the severe psychoses to the compulsive behavior reactions. The latter group were by far the largest. The patients studied, practically all men, belonged to all age groups, social strata, and educational levels. They do not fit the general public's mental picture of a "sex maniac" in that they seldom, if ever, go beyond the simple act of exposure. They make no attempt to attack or molest. "The offense of sexual exhibitionism is a frank asocial sexual approach, defeating its very purpose." The offense, "when not a psychotic manifestation, is at least evidence of serious personality maladjustment. The behavior showed an essentially compulsive character." This is brought out in the appended case histories.

In these histories the subject is presented from the viewpoint of the patient himself, that of his family, society, and law enforcement agencies. The tremendous need for behavior clinics is made apparent. Most current literature on exhibitionists comes from personnel attached to these clinics, of which there are only 7 in the country. These have as their purpose the study, diagnosis, and treatment of criminal cases referred by the courts, prosecuting and defense attorneys, and social agencies. They provide medical and psychiatric help in determining the disposition of puzzling cases so that justice may prevail and offenders be given the opportunity for rehabilitation. Thus these communities are no longer blindly punitive in their treatment of these sick people. It is hoped that the publication of this excellent book will stimulate more communities to take more enlightened action in the study and handling of their mentally ill who run afoul of their legal codes. —*Commander F. H. Ocko, MC, U. S. N.*

MEDICAL MANAGEMENT OF GASTROINTESTINAL DISORDERS, by Garnett Cheney, M. D., *Clinical Professor of Medicine, Stanford University Medical School.* 478 pages. 29 figures. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $6.75.

The author has given to the medical profession a work which is practical, up-to-date, easy to read, and filled with common sense. The work reflects not only the experience of the author but also that of many others. Some portions apparently reflect the influence of the author's father who for many years was in general practice. The book is divided into two parts, "The Patient Approach" and "Symptom Diagnosis and Treatment." The examination of the patient (including history taking, physical examination, and routine and special laboratory procedures) is discussed in the first part. Not only the significance and management of symptoms but also disease syndromes are covered in Part II. Although some of the ideas and methods expressed are controversial, the reviewer gets the impression that the author has found them workable. This book is recommended for recent graduates and for general practitioners.

—*Col. P. S. Fancher, MC, U. S. A.*

SOME RELATIONS BETWEEN VISION AND AUDITION, by J. Donald Harris, Ph. D., *Head, Sound Section, U. S. Naval Medical Research Laboratory, New London, Conn.* Publication Number 71, American Lecture Series. 56 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $1.50.

This interesting, well-integrated monograph presents many phases of audio-visual relationships through physical and physiologic comparisons drawn from a wealth of notable references. The author's view that intersensory facilitation has more of a neurologic basis than is generally supposed seems well supported. The chapters on comparison of differential sensitivity, critical flicker frequency, bilateral interaction, and comparison of single nerve fiber activity merit frequent reference by those interested in the interaction of our two most important senses. This book should be in the possession of every otologist and ophthalmologist.

—*Commander L. E. Wible, MC, U. S. N.*

ACRYLIC INLAYS, CROWNS AND BRIDGES, by Irwin Robert Levy, D. D. S., *formerly Director, American Training Institute; Chief of Dental Clinic, Big Sisters Organization; Assistant Dentist, Mt. Sinai Hospital, New York City; Director, Dental Division, Eastern School for Physician's Aides; Author of "Textbook for Dental Assistants."* 128 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $3.75.

This is a brief, well-illustrated dissertation on the development and use of acrylic resins in the field of operative dentistry and crown and bridge prosthesis. Illustrated, step by step technics are concisely presented. Almost all accepted technics are covered. Although the disadvantages of acrylic resins for these types of restorations are hardly mentioned, and the bibliography is meager, this book is easily readable and very practical.—*Maj. E. H. Smith, Jr., DC, U. S. A.*

TEXTBOOK OF ENDOCRINOLOGY, edited by Robert H. Williams, M. D., *Executive Officer and Professor of Medicine, University of Washington Medical School, Seattle,* with the collaboration of Peter H. Forsham, Harry B. Friedgood, John Eager Howard, Edwin J. Kepler, William Locke, L. Harry Newburgh, Edward C. Reifenstein, Jr., William W. Scott, George Van S. Smith, George W. Thorn, and Lawson Wilkins. 793 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $10.

This book follows the general plan of most texts in endocrinology in presenting the subject material by individual endocrine glands. In addition to the editor, 10 well-known collaborators have contributed chapters to this book. Its broad scope makes it an excellent reference work providing a wealth of factual data and practical clinical information. Hypoglycemia is rather sketchily discussed. Such etiologic factors as adrenal insufficiency, liver disease, and functional hypoglycemia have been omitted. The authors are to be congratulated on making little reference to the vast subject of ACTH and cortisone. The section on neuroendocrine and psychodynamic aspects of the endocrinopathies is presented as an integral part of this rapidly expanding field. Commonly used laboratory tests are described and their clinical applications are presented.

—*Col. F. W. Pruitt, MC, U. S. A.*

ROOT CANAL THERAPY, by Louis I. Grossman, D. D. S., Dr. med. dent., *Assistant Professor of Oral Medicine, The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania.* 3d edition, thoroughly revised. 368 pages, 119 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $6.50.

This well-organized and carefully written text gives to the student and practitioner of dentistry a simple but scientifically sound blueprint of the principles and

procedures involved in making the science of endodontia a practical and worthwhile health measure. It helps to eliminate from our minds that carelessness and vagueness which has crept into this phase of dental science and has allowed our medical conferees to question whether what we do is in the best interests of the patient. The author first describes in detail the etiology and pathology of the various disturbances of the pulp and peroidontal structures and the diagnostic tests to help determine the nature of the disturbance. The indications and technics involved for pulp capping and pulpotomy are carefully considered. This is followed by a discussion on the technic of treating and filling the pulpless tooth. Much credit is due to the author for his insistence on absolute sterility and the use of the rubber dam in these procedures. Canals are not to be filled until negative cultures are obtained.

The role played by and the use of antibiotics singly and in combinations (especially the penicillin, bacitracin, streptomycin, and caprylate sodium mixture) are evaluated and they represent a step forward in control of refractory root canal infections. The final chapter on indications for root canal work in children is invaluable because it emphasizes the importance of making all efforts to prevent the untimely loss of deciduous teeth. The technic for pulpotomy and root canal treatment is presented with the understanding that this work be attempted only in selected and cooperative patients. The dentist who arbitrarily prefers exodontia to attempts at conservation of members of the natural arch will do well to give thought to the principles set forth in this book.

*—Capt. M. Dicher, U. S. A. F. (DC)*

BRAIN AND BEHAVIOUR: Induction as a Fundamental Mechanism of Neuro-Psychic Activity. An Experimental and Clinical Study with Consideration of Educational, Mental-Hygenic, and General Sociological Implications, by N. E. Ischlondsky, M. D. 182 pages: illustrated. C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price $7.

The author has engaged in the investigation of a fundamental mechanism of neuropsychic activity induction for 10 years. Induction is defined as the mechanism by which every manifestation leads, under certain well-defined conditions to the appearance of an opposite process. Thus a focus of excitation produced in the brain and spinal cord, under appropriate conditions, gives rise to a focus of inhibition—negative induction. The reverse process is also true. The initial portions of the book are concerned with an explanation and analysis of the author's original experiments. These experimental technics are classified under six headings, including conditioned reflex experiments, the investigation of the sensory threshold, and others. From these investigations, the author concludes that induction is an independent nervous mechanism, operation at all levels of the nervous system. The conditions necessary for every manifestation of induction are: (1) functional antagonism between involved nervous centers, (2) certain intensity of the primary nervous process, (3) sporadic not gradual changes in the intensity of this process, and (4) inconsistency in its establishment.

The concept of induction is seemingly adequate, and at least plausible to explain the experimental observations cited in the book, but when its use is generalized to explain, in part at least, emotional reactions, intellectual processes, and psychopathic behavior, it is questionable. Ischlondsky criticizes the psychologists, particularly the analyst, for a purely subjective, speculative psychologic analysis of human behavior. In the last few pages of the monograph he appears to be open to a similar criticism. However, the author proposes a

new perspective in explaining emotions and behavior, which should be of interest to all psychiatrists and psychologists, regardless of orientation.

—*Capt. J. J. Kavanagh, U. S. A. F. (MC)*

HARVEY CUSHING, Surgeon, Author, Artist, by Elizabeth H. Thomson. Foreword by John F. Fulton. 347 pages; illustrated. Henry Schuman, Inc., New York, N. Y., publisher, 1950. Price $4.

This is a very entertaining and instructive book. It gives one an intimate glimpse of Dr. Cushing's early life and throws light on incidents which molded his character. Much more is made of Mrs. Cushing's influence than in other biographies which have appeared. Previous biographers have emphasized Dr. Cushing's greatness and pioneer spirit. This book, while not minimizing his greatness, brings out his humanness. It clearly records that he was a driver and one who would not forgive a mistake or tolerate anything from his juniors except perfection. Dr. William Osler had great influence on Dr. Cushing, and his death was keenly felt by Dr. Cushing. The early days of the Johns Hopkins Medical School are described and the great impression that school made on Dr. Cushing is discussed at length. Dr. Cushing had many calls to fill various professorships but was reluctant to leave Johns Hopkins or Harvard for a position where he could not live and work in academic freedom. This book should be an inspiration to young physicians. —*Col. D. M. Walker, MC, U. S. A.*

LIPPINCOTT'S QUICK REFERENCE BOOK FOR NURSES, by Helen Young, R. N., *Director of Nursing, Emeritus, Columbia Presbyterian Medical Center. Editorial Board, Department of Nursing, Faculty of Medicine, Columbia University, Presbyterian Hospital School of Nursing, New York:* Mary Elizabeth Allanach, A. M., R. N., *Assistant Professor of Nursing;* Elizabeth S. Gill, B. S., R. N., *Instructor in Nursing;* Eleanor Lee, A. B., R. N., *Assistant Professor of Nursing;* G. Harriet Mantel, A. M., R. N., *Instructor in Nursing;* Helen F. Pettit, B. S., R. N., *Assistant Professor of Nursing.* 6th edition. 626 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $3.

This comprehensive review of the essentials of nursing practice includes (1) general information; (2) materia medica; (3) nursing technics; (4) dietotherapy; (5) medical and surgical nursing; and (6) obstetric nursing. The information included is not detailed, but the material is carefully selected. The material under each topic is arranged alphabetically and is easily found. Condensed tables in the sections on diet therapy, common contagious diseases, and poisons and treatments are very helpful. Although discussion of psychiatric disorders and of principles of psychiatric nursing is omitted, the section on nursing technics includes procedures for the application of restraints and for a sedative pack. Under medical and surgical nursing, such topics as alcoholism, convulsions, epilepsy, and vascular diseases of the brain are included. This book should prove helpful to nurses at foreign duty stations or at smaller stations where reference books are limited. It could be recommended to experienced hospital corpsmen who are on independent duty as a most useful adjunct to the Hospital Corps Manual. —*Lt. C. Maas, NC, U. S. N.*

OFFICE TREATMENT OF THE NOSE, THROAT, AND EAR, by Abraham R. Hollender, M. Sc., M. D., F. A. C. S., *Professor of Otolaryngology, Emeritus, University of Illinois College of Medicine; Attending Otolaryngologist, St. Francis Hospital and Mt. Sinai Hospital, Miami Beach; Consulting Otolaryngologist, Variety Children's Hospital, Miami, Fla.* 3d edition. 620 pages: illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $7.50.

The author stresses the importance and the details of the office management of the many conditions of the ear, nose, and throat which can be adequately treated in the office with some simple supplemental home measures. This edition deletes some material formerly included and presents new developments in otolaryngology. Nutrition, physical medicine, and psychosomatic problems have been given increased consideration. Established principles and procedures are described. The text is essentially sound, even though the advisability of a few of the procedures recommended such as (*a*) the local use of sulfonamides in acute empyema of the maxillary sinus, and (*b*) the irradiation of the nasopharynx for a nonmalignant condition may be questioned by some. More information might be desired on the problems of the patient who must select a hearing aid. On the whole it is well organized, well written, and will be a valuable addition to the library of the otolaryngologist or the general practitioner.

—*Col. H. S. Murphey, MC, U. S. A.*

HANDBOOK OF OBSTETRICS AND DIAGNOSTIC GYNECOLOGY, by Leo Doyle, M. S., M. D. Illustrations by Ralph Sweet. 240 pages; illustrated. University Medical Publishers, Palo Alto, Calif., publishers, 1950. Price $2.

The author of this compendium has included some very practical illustrations and charts. He has thoroughly reviewed the literature and has brought the material up to date. He discusses the emotional aspects of pregnancy and presents a practical approach to the minor symptoms of pregnancy which are of special interest to the general practitioner. The chapter on alleviation of pain in labor outlines all the modern concepts except for hypnosis and the more indefinite methods expressed by Read in "Childbirth Without Fear." The chapter on delivery in the home should interest the general practitioner. Practically all of the major aspects of obstetrics are covered and references are given to current pertinent papers of interest. The role of the Rh factor and emergency procedures in obstetrics are covered. The section on diagnostic gynecologic entities deals mainly with classification and the practical solution of those problems without entering into the controversial aspects of the particular subject. Laboratory data and an obstetrical calendar are printed on the inside covers.

—*Maj. H. L. Riva, MC, U. S. A.*

THE PHYSIOLOGICAL BASIS FOR OXYGEN THERAPY, by Julius H. Comroe, Jr., *Professor of Physiology and Pharmacology, Graduate School of Medicine, University of Pennsylvania; Clinical Physiologist, Hospital of the University of Pennsylvania;* and Robert D. Dripps, *Professor of Anesthesiology, University of Pennsylvania School of Medicine. Director of Anesthesiology, Hospital of the University of Pennsylvania.* Publication Number 42, American Lecture Series. 85 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

This excellent monograph emphasizes the rational physiologic basis for oxygen therapy. It does not describe any technics, but states clearly the rationale of the use of oxygen in modern therapeutics. Various theories are discussed and the reader is allowed to draw his own conclusions regarding them. Although this monograph does not present anything new it affords an able condensation of the available material on the subject under discussion. It should prove of great value to nurses or physicians who treat patients with oxygen and indispensable to students in medicine and residents of anesthesiology.

—*Maj. D. E. MacQuigg, MC, U. S. A.*

CEREBRAL ANGIOGRAPHY, by P. Almeida Lima, *Professor of Neurology, Lisbon Faculty of Medicine; Head of the Neurosurgical Department, Hospital Julio De Matos, Lisbon,* with an introduction by Egas Moniz, *formerly*

*Professor of Neurology, Lisbon Faculty of Medicine, Nobel Prize 1949.* Foreword by Sir Hugh Cairns, K. B. E., D. M., F. R. C. S., *Nuffield Professor of Surgery in the University of Oxford.* 221 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price $8.75.

This outstanding monograph covers the subject of cerebral angiography thoroughly and skillfully. It is well written, understandable, and has an adequate number of illustrations. The history of cerebral angiography is reviewed briefly and the technic used by the author is described in detail. It is unfortunate that the chapter dealing with technic, written in 1946, has not been brought up to date because, as pointed out in a footnote, numerous improvements have been made since that time. The author recommends the use of thorotrast and transcutaneous injection, whereas diodrast permits percutaneous injection and is more popular at present. The normal arteriogram is shown both schematically and by photographic reproduction with several variations. Successive chapters deal with the use of the arteriograms to localize tumors, ventricular dilatation, and diagnosis of intracranial tumors. Here again the illustrations are an excellent supplement to the text. In fact, the 181 diagrams and illustrations suggest the use of this book as an atlas. This is probably the best book in its field and one which many clinicians will find of great value.

—*Col. E. R. Inwood, MC, U. S. A.*

ESSENTIALS OF MEDICINE, The Basis of Nursing Care, by Charles Phillips Emerson, Jr., A. B., M. D., *Associate Professor of Medicine, Boston University School of Medicine; Member, Robert Dawson Evans Memorial Laboratory; Visiting Physician and Physician in Charge of Clinical Laboratories, Massachusettts Memorial Hospitals; Attending Physician, Cushing Veterans' Administration Hospital and Medical Consultant, American Red Cross;* and Jane Elizabeth Taylor, R. N., B. S., M. Ed., *Lecturer, Frances Payne Bolton School of Nursing, Western Reserve University; formerly Nursing Education Consultant, U. S. Public Health Service; formerly Assistant Professor of Medical Nursing, Yale University School of Nursing, and Assistant in Charge of Medical Nursing, New Haven Hospital.* 16th edition, revised and reset. 815 pages; 191 illustrations, including 5 subjects in full color. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1950. Price $4.

This book deals with every field of medicine including the specialties. It is divided into 12 units, each dealing with a body system. The orientation sections preceding each unit give the aims and scope of the unit. Clinical situations at the end of each unit help the reader to grasp concepts of the total care of the patient and treatment of the patient as a person. The principles discussed in this book are phases of nursing related to prevention, recognition, and treatment of varied diseases. In this latest edition scientific and sociologic principles related to medical nursing have been correlated. This is an excellent book for use as a text for nurses. Although the authors have used lay terminology suitable for instructing students, the content is excellent as a reference for graduate nurses as well. The illustrations are meaningful. The 2-column page facilitates reading, and helpful references are given at the end of each unit.

—*Lt. E. Pullekinus, NC, U. S. N.*

UROLOGIC ROENTGENOLOGY, by Miley B. Wesson, M. D., *Past President American Urological Association.* 3d edition. 282 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $7.50.

The new edition of this popular and authoritative work is fully up to date. The text has been revised thoroughly and all important new developments in

urography added. Perirenal insufflation and laminography are two of the newer diagnostic methods described in the chapter on technics of urography. Pararenal ganglioneuroma, thrombosis of the renal vein, Paget's disease, and osteitis pubis are among the new headings in this edition. Sixty new illustrations have been added and the text has been enlarged by 23 pages. Many old plates have been discarded and new, more representative ones added.

As in the two preceding editions, the quality of the paper and the clarity of the reproduced roentgenograms are particularly praiseworthy. The plates have been chosen with care so that the roentgenologic findings are typical of the disease entities and may be readily demonstrated by the accompanying, concise descriptions. Especially remarkable are the brief case histories which are printed beside many of the representative roentgenograms. The text is not too technical for the newcomer to the subject of urography and, at all times, the emphasis is placed on clinical diagnosis, confirmed by roentgenographic and laboratory studies and proved by operative or postmortem findings.

The index has been thoroughly revised and brought up to date. Many new headings have been added and others have been reclassified in the interest of accuracy. Particularly noteworthy are the references, found at the end of each chapter. As stated by the author in the preface to the second edition (1946), his "aim is not to supply a treatise, but to provide a *vade mecum*." In this purpose, he has succeeded admirably. This text is invaluable to both the urologist and the roentgenologist. It is particularly valuable in the teaching of residents in both specialties. —*Capt. S. Johnson, MC, U. S. N.*

ORAL AND FACIAL CANCER, by Bernard G. Sarnat, M. D., F. A. C. S., *Professor and Head of the Department of Oral and Maxillofacial Surgery, College of Dentistry, and Clinical Assistant Professor of Surgery, College of Medicine and Research and Educational Hospital, University of Illinois, Chicago; Diplomate of the American Board of Plastic Surgery;* and Isaac Schour, D. D. S., Ph. D., Sc. D., *Coordinator of Cancer Instruction, Professor and Head of the Department of Histology and Associate Dean in Charge of Postgraduate Studies, University of Illinois College of Dentistry, Chicago,* with a foreword by Andrew C. Ivy, Ph. D., M. D., D. Sc., *Vice-President in Charge of Chicago Professional Colleges, University of Illinois; Executive Director of The National Advisory Cancer Council.* 300 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $6.

This well-written book, although somewhat elementary, is highly recommended to the general practitioner, both medical and dental, as a guide in the early diagnosis and treatment of oral and facial cancer and to the student for use as a text. It is divided into three parts; the first dealing with the public health aspects of the cancer problem and the present status of cancer research; the second with the clinical aspects of oral and facial cancer; and the third with the control of oral and facial cancer. As an adjunct to the text proper an appendix with a quick reference list of do's and don'ts, danger signals, and other data, is included. An excellent description of the normal for comparison with the deviations from the normal in the structures involved is presented. The illustrations are excellent. The questions for students at the end of each part of the book are well chosen and will aid the understanding of the material presented. An excellent bibliography is appended. —*Col. A. E. Toye, DC, U. S. A.*

CORONARY CIRCULATION IN HEALTH AND DISEASE, by Donald E. Gregg, M. S., Ph. D., M. D., *Chief Research Physician, Medical Department, Field Research Laboratory, Fort Knox, Ky.* 227 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $4.50.

This book consists of 8 chapters, each with an excellent bibliography. The author begins with a concise statement of the present-day problem of coronary disease and a short discussion of the burden placed on the medical profession in the treatment and prevention of heart disease. He then proceeds with a detailed but easy to read summary of the anatomy of coronary circulation. After acquainting the reader with past and present methods of experimental study, the author goes on with a discussion and an evaluation of the various investigations which have been made on the coronary blood flow, including its characteristics and distribution. Following this he evaluates the various known determinants of flow and the effects of the commonly used drugs on the coronary circulation. A chapter is devoted to the metabolism of the heart muscle. The final chapter is given to the coronary circulation in heart disease and failure with special emphasis on atherosclerosis of the coronary arteries and its effect on the coronary circulation.

Although much of the material in this book comes from the investigative work of Gregg and his associates, he carefully evaluates the work of other investigators and discusses controversial issues. The mass of detailed description of experimental procedures may not appeal to some clinicians, but in a period when rapid progress is being made in research in heart disease, this briefing as to the nature, reliability, limitations, and pitfalls of the methods used in coronary arterial research should be welcomed. Now that technical methods to study the coronary circulation in situ are available, the effects of various drugs on the circulation should soon be forthcoming. The clinician should understand the hemodynamics of the coronary circulation and be familiar with the methods used in investigative studies if he expects to evaluate the results of future studies.

This book comes at a time when the physicians engaged in clinical and preventive medicine and research are becoming increasingly aware of the importance of heart disease. It behooves the physician, regardless of his special interest, to become apprised of the current advances in knowledge of the coronary circulation and for the clinician who devotes his time to the treatment and prevention of heart disease to learn all he can about it. The Army Medical Service should feel justly proud of fostering this pioneer work in the study of the coronary circulation which will become the background for research in the prevention of the most important of the chronic degenerative diseases.

—*Col. T. W. Mattingly, MC, U. S. A.*

POST-GRADUATE LECTURES ON ORTHOPEDIC DIAGNOSIS AND INDICATIONS, Vol. I, by Arthur Steindler, M. D., F. A. C. S., *Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Iowa.* 280 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $7.50.

This first volume of postgraduate lectures on orthopedic diagnosis and indications by Steindler is divided into two parts: propedeutics in orthopedic diagnosis, and congenital deformities and disabilities. The first section consists of lectures on the symmetry and asymmetry of the body; contractures; the interpretation of pain in orthopedic surgery; and abnormal gaits. These complicated mechanical discussions of basic orthopedics require prolonged study for understanding. The second section consists of lectures on deformities of the extremities, spine, and thorax. Deformities caused by disturbances of bone growth are discussed from the standpoint of pathology, treatment, and so forth. This section is beautifully illustrated by photographs and roentgenogram reproductions. One lecture each is devoted to congenital talipes and to congenital dislocation of the hip. The author corrects clubfoot by use of the Denis Browne splint, wedged plaster casts, and corrective casts, using the Brockmann operation for resistant

and recurrent changes. He makes no mention of transfer of the anterior tibial tendon for recurrent cases. The lecture on congenital dislocation of the hip must be commended for its clarity and completeness.

*—Lt. Comdr. A. B. Dickson, MC, U. S. N.*

TECHNIQUES IN BRITISH SURGERY, edited by Rodney Maingot, F. R. C. S. 733 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price $15.

At first glance the reader might think that this is merely another atlas of technical operative procedures, but is rewarded by discovering a much more comprehensive though concise coverage of surgical disorders. The material is organized into four main parts corresponding to regional anatomy: (1) head, neck, and spinal column; (2) thorax; (3) abdomen and pelvis; and (4) extremities. Within each of these anatomic domains the various pathologic entities in general and specialized fields are discussed in characteristic polished literary style. In addition to operative technic, the chapters include brief historic notes, pathologic anatomy and physiology, pre- and post-operative management, and results obtained by the methods discussed. One thus gets a well-rounded view of each condition. The chapters on congenital cardiac defects, thyroid disorders, tuberculous lesions, peptic ulcer, "synchronous combined resection" for rectal carcinoma, bone grafts, and the management of senile and diabetic gangrene are especially good. On the other hand, for the American reader, too much emphasis has been placed on vagotomy, thoracoplasty, and the management of thoracic empyema. The material is clear and well presented. The book is of value as a basic text and gives a good insight into current British thought.

*—Lt. F. W. Meyer, Jr., MC, U. S. N.*

# Index to United States Armed Forces Medical Journal

## Volume I

### SUBJECTS


ABOUT the Army Medical Service, 121, 227, 602; Emergency personnel planning, 358; Career planning, 359; Emergency personnel planning, 483; Career management for Medical Service Corps, 707; Internships, 821; Medical Department extension courses, 945; Medical Corps officer classification, 1081; Medical Service civilian consultant program, fiscal year 1951, 1235; Draft of doctors of medicine, dentistry, and veterinary medicine, 1359; Medical Service in action, 1363; Additional pay of $100, 1537.

Abscess, epidural, secondary to brucellosis ("Brucella suis"), 218.

Accessory membranous nasolacrimal duct: report of case, 336.

Acrylic jacket, combination porcelain and, 1027.

Adenocarcinoma of second portion of duodenum, 1307.

Adenoma, parathyroid: report of 2 cases, 403.

Administrative. Army field surgeon; specialist, 997; Army Medical Research and Development Board (editorial), 129; British Army divisional medical organization, 1347; Coordination of administrative and professional effort in Army hospitals, 1077; Current trends in medical education, 1065; Female staffing program in Army hospital, 1355; Field training of Army medical officers, 837; Health discipline, 232; Medical history of Berlin airlift, 1249; Medical plans for civil defense and disaster relief, 462; Medical Service Field Research Laboratory, 1343; "Operation Portrex"; I. Medical officer on "Operation Portrex", 1227, II. Medical umpiring of Army units, 1231; Panorama of naval medical research, 1199; ROTC training in Army general hospital, 703; Specialist training of medical officer, Royal Army Medical Corps, 1219; Station hospital as diagnostic and treatment center, 827; Surgeon in the Army: career pattern, 238; Transition of citizen into wartime Armed Forces, 938; Assessment of physical fitness for service in British Army, 1527; Mobilization of medical supply and equipment industry, 1517.

Ainhum: report of case with bilateral involvement, 1039.

Air Force; sound problems in, 449.

Airlift, Berlin; medical history of, 1249.

Air pollution, 1195.

Air transportation of patients; advantages of, 115.

Amebiasis and complement-fixation test, 1337.

Amicrobic pyuria, 205.

Analgesia. Comparison of ephedrine and desoxyephedrine in maintaining blood pressure during spinal analgesia, 1495; Demerol, scopolamine, and caudal analgesia: results in 700 cases, 1437.

Ancylostomiasis; acute abdominal manifestations of: report of 2 cases, 935.

Anesthesia. Continuous spinal anesthesia: ureteral catheter (Tuohy) technique, 424; Pentothal sodium anesthesia for vaginal delivery, 874.

Aneurysm of coronary artery: report of case, 1281.

Anterior fixed bridges: technique for construction by means of one-piece casting, 913.

Antibiotics. Antibiotic drugs in venereal disease therapy, 1017; Clinical use of antibiotics: I, Pharmacology and toxicology, 928; II. Prophylaxis of infections, 1001; III. Treatment of dental infections, 1109; IV. Treatment of infectious processes, 1273; Exfoliative dermatitis following administration of penicillin, 210; Method for testing sensitivity of organisms to antibiotic, 818; Penicillin, allergic hazard, 1155; Resistance and dependence of bacteria to antibiotics (editorial), 711; Streptomycin in pulmonary tuberculosis: treatment of recent posthemoptoic spreads, 137; Streptomycin treatment of tuberculous lymphadenitis, 476; Toxicity of intrathecal penicillin, 806; Antibiotics in gastrointestinal surgery, 1447.

Aorta; combined coarctation and rupture of, 284.

Apocrine hamartomas, 1489.

Appendicitis, acute ruptured, and peritonitis with urinary symptoms, 1191.

Army field surgeon, specialist, 997.

Army medical officers: field training of, 837.

Asthma, bronchial, treatment of, with psychotherapy: report of case, 557.

Atabrine in treatment of cardiac arrhythmias, 495.

Atrophy, insulin, of subcutaneous fat, 325.

Auricular fibrillation following hypothermia: report of case, 418.

BACTERIA; resistance and dependence of, to antibiotics (editorial), 711.

Berlin airlift, medical history of, 1249.

Biceps brachii; disinsertion of: report of case, 543.

Bladder. Endometriosis of urinary bladder, 521; Malocoplakia of urinary bladder: report of case, 1029.

Blood pressure during spinal analgesia; comparison of ephedrine and desoxyephedrine in maintaining, 1495.

Boeck sarcoid; Hutchinson-Besnier-: report of 3 cases and review of literature, 527.

Bone. Bone grafting in saddle nose, 1141; Fundamentals in use and preservation of homogenous bone, 841; Use of anterior iliac crest as source of bone graft, 1431; Repair of mandibular bone defect with bone chips, 1425.

Bony lesions occurring during early stages of syphilis: report of case, 788.

Breast feeding, 1473.

Bridges; anterior fixed: technique for construction by means of one-piece casting, 913.

British Army. Assessment of physical fitness for service in British Army, 1527; British Army divisional medical organization, 1347.

Bronchiectasis, 30.

Bronchogenic carcinoma; primary, 738.

Brucellosis ("Brucella suis"); epidural abscess secondary to, 218.

CANCER, thyroid, in young adults: report of 4 cases, 275.

Carcinoma. Adenocarcinoma of second portion of duodenum, 1307; Assay of gonadotropins in diagnosis of neoplasms, 505; Benign esophageal stricture and carcinoma of esophagus, 447; Carcinoma of lung: report of case simulating pleural mesothelioma, 269; Carcinosarcoma of uterus: report of case, 540; Detection of early carcinoma of uterus, 1095; Early detection of carcinoma of cervix uteri,

1021; Exfoliative cytology service in Army hospital, 1151; Malignancies of colon: discussion of some problems, 257; Malignant neoplasms of skin, 266; Primary bronchogenic carcinoma, 738; Subacute granulocytic leukemia: report of case following infectious mononucleosis, 413; Thyroid cancer in young adults: report of 4 cases, 275; Tumors of testes: 5-year follow-up study, 719; Carcinoma of prostate, 1411.
roid cancer in young adults: report of case, 540.
Cardiac arrhythmias; atabrine in treatment of, 495.
Cardiac vessels; transposition of great, 1483.
Career management for Medical Service Corps; About the Army Medical Department, 707.
Career planning; About the Army Medical Department, 359.
Caudal analgesia: demerol, scopolamine, and: results in 700 cases, 1437.
Cavernous hemangioma of left lobe of liver: report of case, 443.
Cephalin cholesterol flocculation test, Hanger, and Maclagan thymol turbidity test: correlation with autopsy findings, 902.
Cervix uteri; early detection of carcinoma of, 1021.
Chemotherapy, tumor; index of, 1541.
Cholesterol flocculation test, Hanger cephalin, and Maclagan thymol turbidity test: correlation with autopsy findings, 902.
Cineplasty; temporary lower extremity, 173.
Circumcision. Circumcision in adult, 1035; Circumcision of newborn: exact technique for use of Gomco clamp, 586.
Citizen into wartime Armed Forces; transition of, 938.
Civil defense and disaster relief; medical plans for, 462.
Cleft palate prosthesis, 311.
Clinical use of antibiotics: I. Pharmacology and toxicology, 928; II. Prophylaxis of infections, 1001; III. Treatment of dental infections, 1109; IV. Treatment of infectious processes, 1273.
Coarctation, combined, and rupture of aorta, 284.
Coitus, normal; laceration of vaginal vault after: report of case, 926.
Cold; survival in, 615.
Colon, malignancies of: discussion of some problems, 257.
Combat areas, psychiatric treatment in, 1379.
Communicable diseases, control of, 366.
Comparison of ephedrine and desoxyephedrine in maintaining blood pressure during spinal analgesia, 1495.
Complement-fixation test; amebiasis and, 1337.
Condyle, mandibular, fractures of: report of 8 cases, 797.
Congestive heart failure: backward and forward failure hypotheses, 377.
Conjunctiva; unusual foreign body in: report of case, 665.
Contracture, Dupuytren's: report of 2 cases, 49.
Corrosion, hip nail, 654.
Creeping eruption; treatment of, with hetrazan: report of 13 cases, 668.
Cryptococcosis: review of literature and report of case with initial pulmonary findings, 957.
Cryptococcus neoformans meningo-encephalitis: report of fatal case, 866.
Cutaneous diphtheria, 778.
Cyst. Mesenteric cyst complicated by intestinal obstruction: report of case, 437; Cyst of mandible: report of case with prosthetic restoration, 881; Cyst of patent urachus, 433; Bilateral dermoid cysts and pregnancy: report of case, 46.

DEATH, true cause of, 1084.
Delivery, vaginal; pentothal sodium anesthesia for, 874.
Demerol, scopolamine, and caudal analgesia: results in 700 cases, 1437.
Dental pathology. Fractures of mandibular condyle: report of 8 cases, 797; Prophylactic odontotomy, 107; Systemic effects of oral foci of infection, 225.
Dental prosthesis. Anterior fixed bridges: technique for construction

by means of one-piece casting, 913; Cleft palate prosthesis, 311; Combination porcelain and acrylic jacket, 1027; Cyst of mandible: report of case with prosthetic restoration, 881; Disfiguring malocclusion: correction by cosmetic prosthesis, 309; Efficient full denture service, 1121; Planning, organization, and administration of large dental prosthetic activity during wartime, 340; Prosthetic restoration in gross malocclusion, 567; Prosthodontia in diastema, 1149; Retromolar area: its significance in full and partial denture construction, 898; Planning and designing removable partial dentures, 1465; Fabrication of porcelain jacket crown, 1435.

Dental prosthetic activity during wartime; planning, organization, and administration of large, 340.

Denture construction, full and partial; retromolar area: its significance in, 898.

Dentures; planning and designing removable partial, 1465.

Dermatology. Acute disseminated lupus erythematosus: report of 3 cases in young Polish men, 409; Cutaneous diphtheria, 778; Eczematous dermatitis: rational medical approach, 672; Erythema exudativum multiforme (Stevens-Johnson syndrome), 886; Exfoliative dermatitis following administration of penicillin, 210; Glanders, 781; Herpes zoster with concurrent encephalitis: report of case, 222; Idiopathic thrombocytopenic purpura: splenectomy and toluidine blue in treatment, 759; Malignant neoplasms of skin, 266; Relationship of bullous staphylococcic impetigo and exfoliative dermatitis of newborn, 682; Syndrome of circumoral pigmentation associated with generalized intestinal polyposis: report of case, 773; Thrombocytopenic purpura: discussion and report of case, 553; Treatment of creeping eruption with hetrazan: report of 13 cases, 668; Treatment of herpes zoster with protamide, 1045; Treatment of Rhus dermatitis, 562; Periarteritis nodosa, 1503.

Dermoid cysts, bilateral, and pregnancy: report of case, 46.

Desoxyephedrine in maintaining blood pressure during spinal analgesia; comparison of ephedrine and, 1495.

Diarrhea. Epidemic of vomiting and diarrhea, 861; Infant diarrhea, 1265.

Diastema, prosthodontia in, 1149.

Diphtheria, cutaneous, 778.

Disaster relief; civil defense and, medical plans for, 462.

Disinsertion of biceps brachii: report of case, 543.

Diuretic, mercurial, for subcutaneous administration: thiomerin, 332.

Diverticulum, Meckel's, complications of: report of 9 cases, 1329.

Draft of doctors of medicine, dentistry, and veterinary medicine: about the Army Medical Service, 1359.

Duodenum. Adenocarcinoma of second portion of duodenum, 1307; Extrusion of redundant gastric mucosa into duodenum, 12.

Dupuytren's contracture: report of 2 cases, 49.

Dysplasia, monostotic fibrous, of skull: report of case, 1323.

ECTOPIC pregnancy, recurrent: report of case, 550.

Eczematous dermatitis: rational medical approach, 672.

Education, medical; current trends in; 1065.

Emergency personnel planning: about the Army Medical Department, 358, 483.

Empyema in infancy, 1419.

Encephalitis, concurrent; herpes zoster with: report of case, 222.

Endometriosis of urinary bladder, 521.

Endotracheal tube, long-cuff: its manufacture and use, 58.

Ephedrine and desoxyephedrine in maintaining blood pressure during spinal analgesia; comparison of, 1495.

Epidural abscess secondary to brucellosis ("Brucella suis"), 218.

Equipment industry, medical supply and; mobilization of, 1517.

Eruption, creeping; treatment of, with hetrazan: report of 13 cases, 668.

Erythema exudativum multiforme (Stevens-Johnson syndrome), 886.
Erythematosus, acute disseminated lupus; report of 3 cases in young Polish men, 409.
Esophagus, carcinoma of; benign esophageal stricture and, 447.
Exfoliative cytology service in Army hospital, 1151.
Exfoliative dermatitis following administration of penicillin, 210.
Extension courses, Medical Department: about the Army Medical Department, 945.

FAT. Insulin atrophy of subcutaneous fat, 325; Isolated fat replacement of body and tail of pancreas: report of case, 1313.
"Feet, painful" in American prisoners of war, 146.
Female staffing program in army hospital, 1355.
Fever, relapsing; spontaneous rupture of spleen in, 88.
Fibrillation, auricular, following hypothermia: report of case, 418.
Fibrocystic disease of pancreas; review of literature and report of case, 629.
Field training of Army medical officers, 837.
Flocculation test, Hanger cephalin cholesterol, and Maclagan thymol turbidity test: correlation with autopsy findings, 902.
Fluoroscopy, orthodiascopic measurements during: a device, 422.
Flying, high altitude; physiological effects of, 317.
Foci, oral, of infection; systemic effects of, 225.
Foot-and-mouth disease in Mexico, 785.
Foreign body, unusual, in conjunctiva: report of case, 665.
Fractures of mandibular condyle: report of 8 cases, 797.

GASTRIC mucosa. Extrusion of redundant mucosa into duodenum, 12; Prolapse of redundant gastric mucosa, 639.
Gastrointestinal system. Acute abdominal manifestations of ancylostomiasis: report of 2 cases, 935; Acute ruptured appendicitis and peritonitis with urinary symptoms, 1191; Adenocarcinoma of second portion of duodenum, 1307; Complications of Meckel's diverticulum: report of 9 cases, 1329; Extrusion of redundant gastric mucosa into duodenum, 12; Mesenteric cyst complicated by intestinal obstruction: report of case, 437; Prolapse of redundant gastric mucosa, 639; Syndrome of circumoral pigmentation associated with generalized intestinal polyposis: report of case, 773; Antibiotics in gastrointestinal surgery, 1447.
Genitourinary system. Amicrobic pyuria, 205; Carcinosarcoma of uterus: report of case, 540; Circumcision in adult, 1035; Circumcision of newborn: exact technique for use of Gomco clamp, 586; Cyst of patent urachus, 433; Early detection of carcinoma of cervix uteri, 1021; Endometriosis of urinary bladder, 521; Laceration of vaginal vault after normal coitus: report of case, 926; Malacoplakia of urinary bladder: report of case, 1029; Renal infarction: report of 2 cases, 292; Torsion of spermatic cord, 733; Urinary excretion of 17 ketosteroids in tetraplegic and paraplegic patients: preliminary metabolic report, 583; Carcinoma of prostate, 1411.
Glanders, 781.
Gomco clamp; circumcision of newborn: exact technique for use of, 586.
Gonadotropins; assay of, in diagnosis of neoplasms, 505.
Gunshot wounds in 8th Air Force in World War II, 22.

HAMARTOMAS, apocrine, 1489.
Hanger cephalin cholesterol flocculation test and Maclagan thymol turbidity test: correlation with autopsy findings, 902.
Health discipline, 232.
Health, public, in Japan; nutrition in, 694.
Hearing. Psychologic approach to hard of hearing patients, 203; Problems in hearing, 590.
Heart, Ante-mortem diagnosis of secondary tumors of heart: report of 4

cases, 750; Atabrine in treatment of cardiac arrhythmias, 495; Auricular fibrillation following hypothermia: report of case, 418; Combined coarctation and rupture of aorta, 284; Congestive heart failure: backward and forward failure hypotheses, 377; Superior vena cava obstruction: review and report of 2 cases, 648; Transposition of great cardiac vessels, 1483; Superior vena caval syndrome: report of 2 cases, 1455.

Hemagglutination by neurotropic viruses, 920.

Hemangioma, cavernous, of left lobe of liver: report of case, 443.

Hernia, traumatic diaphragmatic: report of case with concomitant splenectomy and nephrectomy; repair of, 1413.

Herpes zoster. Herpes zoster with concurrent encephalitis: report of case, 222; Herpes zoster concurrent with varicelliform eruption: report of 5 cases, 1499; Treatment of herpes zoster with protamide, 1045.

Hetrazan; treatment of creeping eruption with: report of 13 cases, 668.

High altitude flying, physiological effects of, 317.

Hip nail corrosion, 654.

Homogenous bone; fundamentals in use and preservation of, 841.

Hutchinson-Besnier-Boeck sarcoid: report of 3 cases and review of literature, 527.

Hyperthyroidism: diagnosis and treatment, 1.

Hypothermia, auricular fibrillation following: report of case, 418.

IDIOPATHIC thrombocytopenic purpura: splenectomy and toluidine blue in treatment, 759.

Iliac crest, anterior, as source of bone graft; use of, 1431.

Immunizations for foreign travel, 119.

Impetigo, bullous staphylococcic; relationship of, and exfoliative dermatitis of newborn, 682.

Infarction, renal: report of 2 cases, 292.

Infants, premature, care of, 1115.

Infection, oral foci of; systemic effects of, 225.

Infectious mononucleosis; subacute granulocytic leukemia: report of case following, 413.

Insulin atrophy of subcutaneous fat, 325.

Insulin resistance: mechanisms involved and influence of infection and refrigeration, 1399.

Internships; about the Army Medical Department, 821.

Intestinal obstruction, mesenteric cyst complicated by: report of case, 437.

Intolerance to quinacrine, treatment of, 1167.

Isotopes, clinical and laboratory use of, 367.

JAPAN. Mosquito control problems in Japan, 812: Nutrition in public health in Japan, 694.

KETOSTEROIDS, 17; urinary excretion of, in tetraplegic and paraplegic patients: preliminary metabolic report, 583.

Kuentscher; experiences with marrow nail operation according to principles of: Part V, 65; Part VI, 175.

LACERATION of vaginal vault after normal coitus: report of case, 926.

Laelaptid mites as disease vectors, 321.

Leishmaniasis; visceral, 661.

Leukemia, subacute granulocytic: report of case following infectious mononucleosis, 413.

Listerella monocytogenes meningitis: report of case, 894.

Liver; cavernous hemangioma of left lobe of: report of case, 443.

Lower extremity cineplasty; temporary, 173.

Lower nephron nephrosis: report of 2 cases treated with intravenous procaine, 296.

Lung. Bronchiectasis, 30; Carcinoma of lung: report of case simulating pleural mesothelioma, 269; Cryptococcosis: review of literature and report of case with initial pulmonary findings, 957; Primary bronchogenic carcinoma, 738; Spontaneous pneumothorax: observations on 26 cases, 1157; Treatment of bronchial asthma

with psychotherapy: report of case, 557.
Lupus erythematosus, acute disseminated: report of 3 cases in young Polish men, 409.
Lymphadenitis, tuberculous; streptomycin treatment of, 476.

MACLAGAN thymol turbidity test; correlation with autopsy findings; Hanger cephalin cholesterol flocculation test and, 902.
Malacoplakia of urinary bladder: report of case, 1029.
Malignancies of colon: discussion of some problems, 257.
Malignant neoplasms of skin, 266.
Malocclusion, disfiguring: correction by cosmetic prosthesis, 309.
Malocclusion, gross: prosthetic restoration in, 567.
Mandible. Cyst of mandible: report of case with prosthetic restoration, 881; Fractures of mandibular condyle: report of 8 cases, 797.
Mandibular bone defect with bone chips; repair of, 1425.
Marrow nail operation according to principles of Kuentscher; experiences with: Part V, 65, Part VI, 175.
Medical Corps officer classification; about Army Medical Service, 1081.
Medical Department extension courses; about Army Medical Department, 945.
Medical education, current trends in, 1065.
Medical plans for civil defense and disaster relief, 462.
Medical Service civilian consultant program, fiscal year 1951; about Army Medical Service, 1235.
Medical Service Corps, career management for; about Army Medical Department, 707.
Medical Service Field Research Laboratory, 1343.
Medical Service in action; about Army Medical Service, 1363.
Medicine, military; implications of (editorial), 124.
Meningitis; listerella monocytogenes: report of case, 894.
Meningococcemia, 1179.
Meningo-encephalitis; cryptococcus neoformans: report of fatal case, 866.
Mental reactions of airborne soldier, 1301.
Mercurial diuretic for subcutaneous administration: thiomerin, 332.
Mesenteric cyst: report of case, 1185.
Mesenteric cyst complicated by intestinal obstruction: report of case, 437.
Mesothelioma, pleural; carcinoma of lung: report of case simulating, 269.
Methemoglobinemia in infants; relation of nitrate nitrogen concentration in well water to occurrence of, 1007.
Mexico, foot-and-mouth disease in, 785.
Military medicine; implications of (editorial), 124.
Mites, laelaptid, as disease vectors, 321.
Mobilization of medical supply and equipment industry, 1517.
Monostotic fibrous dysplasia of skull: report of case, 1323.
Morphine. (Ab)use of morphine (editorial), 247; Morphine withdrawal: report of case, 328.
Mosquito control problems in Japan, 812.
Motion sickness. Effectiveness of newer drugs in seasickness, 570; Motion sickness, 979.
Mucosa. Prolapse of redundant gastric mucosa, 639; Extrusion of redundant gastric mucosa into duodenum, 12.
"Mycobacterium tuberculosis," para-aminosalicylic acid resistant: incidence in cases treated at Fitzsimons Army Hospital, 1137.
Myxedema, bilateral circumscribed pretibial: report of case, 767.

NAIL corrosion, hip, 654.
Nasolacrimal duct, accessory membranous: report of case, 336.
Naval medical research, panorama of, 1199.
Neoplasms. Assay of gonadotropins in diagnosis of neoplasms, 505; Malignant neoplasms of skin, 266.
Nephrectomy; repair of traumatic diaphragmatic hernia: report of case with concomitant splenectomy and, 1413.
Nephrosis, lower nephron: report of 2 cases treated with intravenous procaine, 296.

Neurotropic viruses. Preservation of neurotropic viruses, 415; Hemagglutination by neurotropic viruses, 920.
Newborn; relationship of bullous staphylococci impetigo and exfoliative dermatitis of, 682.
Nitrate nitrogen concentration in well water to occurrence of methemoglobinemia in infants; relation of, 1007.
Nutrition in public health in Japan, 694.

OBESITY as problem in preventive medicine, 393.
Obstetrics. Bilateral dermoid cysts and pregnancy: report of case, 46; Pentothal sodium anesthesia for vaginal delivery, 874; Recurrent ectopic pregnancy: report of case, 550; Breast feeding, 1473.
Obstruction. Mesenteric cyst complicated by intestinal obstruction: report of case, 437; Superior vena cava obstruction: review and report of 2 cases, 648.
Odontotomy; prophylactic, 107.
"Operation Portrex". I. Medical officer on "Operation Portrex," 1227; II. Medical umpiring of Army units, 1231.
Oral foci of infection; systemic effects of, 225.
Orthodiascopic measurements during fluoroscopy: a device, 422.
Osteitis fibrosa cystica of rib, 853.
Osteomyelitis, chronic, evaluation of treatment of, 514.
Otology. Problems in hearing, 590; Psychologic approach to hard-of-hearing patients, 203; Sound problems in Air Force, 449.

"PAINFUL FEET" in American prisoners of war, 146.
Panama; pathologic features of yellow fever in, 596.
Pancreas. Fibrocystic disease of pancreas: review of literature and report of case, 629; Isolated fat replacement of body and tail of pancreas: report of case, 1313.
Para-aminosalicylic acid resistant 'Mycobacterium tuberculosis": incidence in cases treated at Fitzsimons Army Hospital, 1137.
Paraplegic patients: urinary excretion of 17-ketosteroids in tetraplegic and: preliminary metabolic report, 583.
Parathyroid adenoma: report of 2 cases, 403.
Pay, additional, of $100; about Army Medical Service, 1537.
Pediatric excretory pyelography, 1163.
Penicillin. Exfoliative dermatitis following administration of penicillin, 210; Toxicity of intrathecal penicillin, 806; Penicillin, allergic hazard, 1155.
Pentothal sodium anesthesia for vaginal delivery, 874.
Periarteritis nodosa: report of case, 1503.
Periodic physical examination (editorial), 488.
Peritonitis with urinary symptoms, acute ruptured appendicitis and, 1191.
Personnel planning, emergency; about the Army Medical Department, 358, 483.
Physical examination, periodic (editorial, 488.
Physical fitness for service in British Army, assessment of, 1527.
Physiological effects of high altitude flying, 317.
Pigmentation, circumoral; syndrome of, associated with generalized intestinal polyposis: report of case, 773.
Plastic surgery; recent advances in, 165.
Pneumothorax, spontaneous: observations on 26 cases, 1157.
Polish men, young; acute disseminated lupus erythematosus: report of 3 cases in, 409.
Polyposis, generalized intestinal; syndrome of circumoral pigmentation associated with: report of case, 773.
Porcelain and acrylic jacket, combination, 1027.
Porcelain jacket crown; fabrication of, 1435.
Porphyria, acute: report of case with post-mortem findings, 214.
Practice knot and suture board, 1049.
Pregnancy. Bilateral dermoid cysts and pregnancy: report of case, 46; Recurrent ectopic pregnancy: report of case, 550.

Premature infants, care of, 1115.
Prisoners of war, American; "painful feet" in, 146.
Prisons. Individual in confinement, 687; "Painful feet" in American prisoners of war, 146; Profile of probation violator, 1051;
Probation violator, profile of, 1051.
Procaine. Lower nephron nephrosis: report of 2 cases treated with intravenous procaine, 296; Administration of procaine intravenously: III. In traumatic surgery, 26; IV. In general surgery and obstetrics, 158; V. In medical conditions, 280.
Progeria in adult (Werner's syndrome): report of case, 578.
Prolapse of redundant gastric mucosa, 639.
Prostate; carcinoma of, 1411.
Prosthesis. Disfiguring malocclusion: correction by cosmetic prosthesis, 309; Cleft palate prosthesis, 311.
Prosthetic restoration. Cyst of mandible: report of case with prosthetic restoration, 881; Prosthetic restoration in gross malocclusion, 567.
Prosthodontia in diastema, 1149.
Protamide; treatment of herpes zoster with, 1045.
Psychiatry in general practice, 91.
Psychiatric treatment in combat areas, 1379.
Psychologic approach to hard of hearing patients, 203.
Psychotherapy; treatment of bronchial asthma with: report of case, 557.
Public health in Japan; nutrition in, 694.
Pulmonary tuberculosis; streptomycin in: treatment of recent posthemoptoic spreads, 137.
Purpura. Idiopathic thrombocytopenic purpura: splenectomy and toluidine blue in treatment, 759; Thrombocytopenic purpura: discussion and report of case, 553.
Pyelography, pediatric excretory, 1163.
Pyuria, amicrobic, 205.

QUINACRINE, treatment of intolerance to, 1167.

REDUNDANT gastric mucosa, extrusion of, into duodenum, 12.
Renal infarction: report of 2 cases, 292.
Retromolar area; its significance in full and partial denture construction, 898.
Rhus dermatitis; treatment of, 562.
Rib; osteitis fibrosa cystica of, 853.
ROTC training in Army general hospital, 703.
Rupture. Combined coarctation and rupture of aorta, 284; Spontaneous rupture of spleen in relapsing fever, 88.

SADDLE nose, bone grafting in, 1141.
Salmonella species of group C in one case of salmonellosis, isolation of three, 1511.
Sarcoid, Hutchinson-Besnier-Boeck: report of 3 cases and review of literature, 527.
Scopolamine, and caudal analgesia: results in 700 cases; demerol, 1437.
Seasickness, effectiveness of newer drugs in, 570.
"Shigella flexneri III" vaccine, field trial of: report of bacteriologic studies, 1285.
"Shigella paradysenteriae" serotypes, isolation of three, from one patient, 1299.
Skin, malignant neoplasms of, 266.
Sound problems in Air Force, 449.
Specialist training of medical officer, Royal Army Medical Corps, 1219.
Spermatic cord; torsion of, 733.
Spinal anesthesia, continuous: ureteral catheter (Tuohy) technique, 424.
Spleen; spontaneous rupture of, in relapsing fever, 88.
Splenectomy and nephrectomy, concomitant; repair of traumatic diaphragmatic hernia: report of case with, 1413.
Splenectomy and toluidine blue in treatment: idiopathic thrombocytopenic purpura, 759.
Station hospital as diagnostic and treatment center, 827.
Stevens-Johnson disease: report of case, 39.
Stevens-Johnson syndrome; erythema exudativum multiforme, 886.

Streptomycin. Streptomycin in pulmonary tuberculosis: treatment of recent posthemoptoic spreads, 137; Streptomycin treatment of tuberculous lymphadenitis, 476.
Stricture, benign esophageal, and carcinoma of esophagus, 447.
Supply and equipment industry, medical; mobilization of, 1517.
Surgeon in the Army: A career pattern, 238.
Surgery, plastic; recent advances in, 165.
Survival in cold, 615.
Syphilis; bony lesions occurring during early stages of: report of case, 788.

TESTES; tumors of: 5-year follow-up study, 719.
Tetraethylammonium chloride in pain, 546.
Tetraplegic and paraplegic patients; urinary excretion of 17 ketosteroids in: preliminary metabolic report, 583.
Thiomerin: mercurial diuretic for subcutaneous administration, 332.
Thrombocytopenic purpura: discussion and report of case, 553.
Thymol turbidity test, Maclagan: correlation with autopsy findings; Hanger cephalin cholesterol flocculation test and, 902.
Thyroid cancer in young adults: report of 4 cases, 275.
Tinea capitis, treatment of, with local medication, 1105.
Toluidine blue in treatment, splenectomy and: idiopathic thrombocytopenic purpura, 759.
Torsion of spermatic cord, 733.
Trachoma, early diagnosis of, 1171.
Tube, long-cuff endotracheal: its manufacture and use, 58.
Tuberculin testing of midshipmen and recruits of Navy and Marine Corps, 971.
Tuberculosis. Para-aminosalicylic acid resistant "Mycobacterium tuberculosis": incidence in cases treated at Fitzsimons Army Hospital, 1137; Streptomycin in pulmonary tuberculosis: treatment of recent posthemoptoic spreads, 137; Streptomycin treatment of tuberculous lymphadenitis, 476; Tuberculin testing of midshipmen and recruits of Navy and Marine Corps, 971.
Tuberculous lymphadenitis; streptomycin treatment of, 476.
Tumor chemotherapy, index of, 1541.
Tumors. Tumors of testes: 5-year follow-up study, 719; Ante-mortem diagnosis of secondary tumors of heart: report of 4 cases, 750.

URACHUS, patent, cyst of, 433.
Ureteral catheter (Tuohy) technique; continuous spinal anesthesia, 424.
Urinary excretion of 17 ketosteroids in tetraplegic and paraplegic patients: preliminary metabolic report, 583.
Uterus. Carcinosarcoma of uterus: report of case, 540; Detection of early carcinoma of uterus, 1095.

VAGINAL delivery; pentothal sodium anesthesia for, 874.
Vaginal vault; laceration of, after normal coitus: report of case, 926.
Vagus resection: study of 19 cases, 985.
Vectors, disease, laelaptid mites as, 321.
Vena cava. Superior vena cava obstruction: review and report of 2 cases, 648; Superior vena caval syndrome: report of 2 cases, 1455.
Venereal disease. Antibiotic drugs in venereal disease therapy, 1017.
Violator, probation, profile of, 1051.
Viruses. Hemagglutination by neurotropic viruses, 920; Preservation of neurotropic viruses, 415.
Visceral leishmaniasis, 661.
Vomiting and diarrhea; epidemic of, 861.

WERNER'S syndrome; progeria in adult: report of case, 578.
Wounds, gunshot, in 8th Air Force in World War II, 22.

X-RAY view box, portable, 1189.

YELLOW fever in Panama; pathologic features of, 596.

# Index to United States Armed Forces Medical Journal

## Volume I

### AUTHORS


| | Page |
|---|---|
| ABERNETHY, Alton C | 296 |
| Anderson, Dorothy T | 1511 |
| Angell, Howard H | 703 |
| Arje, Sidney L | 521, 926 |
| Aronstam, Elmore M | 935 |
| Artz, Curtis P | 639 |
| BABIONE, Robert W | 971 |
| Baldwin, Clifford A., Jr | 1495 |
| Barba, William P., II | 39 |
| Barnes, LaVerne A | 1285 |
| Bartelle, August | 898 |
| Bates, Phillips L | 1029 |
| Bayne, Joseph K | 1227 |
| Bean, Lawrence L | 985 |
| Beer, David C | 296 |
| Bender, Paul B | 1039 |
| Bernstein, Lionel M | 778 |
| Bernstein, Robert | 1301 |
| Berry, James F | 894 |
| Billman, Dallas E | 332 |
| Blank, Harvey | 672 |
| Bliss, Raymond W | 837 |
| Bluemle, Lewis W., Jr | 546 |
| Blumberg, Joe M | 1151 |
| Bly, Chauncey G | 615 |
| Boonstra, Charles E | 1029 |
| Bowers, John T | 1419 |
| Bowers, Warner F | 238, 827, 1077 |
| Brandstadt, Wayne G | 1195 |
| Brody, Alfred | 284 |
| Brown, Charles T | 328 |
| Brown, Jesse F | 158 |
| Brown, Robert B | 437 |
| Byrne, Edward T | 12 |
| CACCAMISE, William C | 661 |
| Cameron, R. D | 1347 |
| Campbell, A. E | 1527 |
| Campbell, John C. W | 1115 |
| Canada, Robert O | 971 |
| Cancer Institute, National, of National Institutes of Health, U. S. Public Health Service | 1541 |
| Cantlie, Sir Neil | 232 |
| Carey, Anna E | 359 |
| Carilia, Thomas A | 1343 |
| Carle, Donald E | 1231 |
| Casberg, Melvin A | 1065 |
| Cavanagh, John R | 1051 |
| Chambers, Wallace L | 88 |
| Churney, Otto L | 1049 |
| Coker, Robert E., Jr | 266 |
| Colyer, Andrew J | 707 |
| Consolazio, C. Frank | 615 |
| Cook, Albert W | 583 |
| Cook, Walter R | 957 |
| Cooper, Henry R | 332, 377 |
| Cornell, Clare B | 203 |
| Cotton, Avery L | 682 |
| Cox, John H | 788 |
| Cox, William W | 1483 |
| Craig, Charles F | 1337 |
| Cronemiller, Phili D | 1329 |
| Crouch, Thomas H | 1431 |
| DAGGS, Ray G | 1343 |
| Dawe, Clyde J | 418 |
| DeKovessey, Charles A | 1163 |
| Delaney, Adrian J | 336, 1323 |
| deTarnowsky, George O | 49 |

| | Page |
|---|---|
| Dimmette, Robert M | 750 |
| Dirksen, Lynn C | 1121 |
| Doucett, James A | 1419 |
| Dressler, Harry R | 1285 |
| Dunlap, Knox | 1189 |
| Durant, Roger C | 1285 |
| Dye, William E | 1137 |
| EATON, Charles H | 495 |
| Edwards, Walton M | 806 |
| Eldredge, Donald H., Jr | 449 |
| Elrod, Ralph P | 1299 |
| Elton, Norman W | 596 |
| Errion, Arthur R | 767 |
| Evans, Pierre O | 309, 567 |
| FASTIGGI, Caesar | 797 |
| Fielding, Fred J | 1081 |
| Figueroa, William G | 615 |
| Fix, Lester W | 269, 275 |
| Force, B. Rodney | 578 |
| Forsee, James H | 738 |
| Foulk, Richard | 527 |
| Fuchs, Adalbert | 1171 |
| Fuller, Roger H | 214 |
| Furtos, Norma C | 137 |
| GANTS, Robert T | 639, 738 |
| Geer, Francis G | 1179 |
| Gerber, Marvin L | 1413 |
| Gerstein, Samuel | 1051 |
| Geschickter, Charles F | 719 |
| Getz, Raymond J | 433 |
| Gilliland, Charles H | 926 |
| Gilman, Robert L | 409, 1155 |
| Glorig, Aram | 590 |
| Gogley, Eleanor H | 1137 |
| Gordon, Edward T | 1191 |
| Govan, Clifton D. Jr | 682 |
| Graf, Russell E | 1307 |
| Gray, Garland A | 49 |
| Gray, John A. C | 476 |
| Gray, John T | 1355 |
| Graybiel, Ashton | 418 |
| Grund, Jacob L | 1489 |
| Grunewald, Alvin H | 340 |
| Gullett, W. Irwin | 1149 |
| HAEBLER, Prof. Dr. C | 65, 175 |
| Hall, Wilford F | 115, 119 |
| Hamilton, Frank E | 443 |
| Hamilton, Gladen R | 733, 1163 |
| Hamperl, Herwig | 284 |
| Harbert, Fred | 979 |
| Harris, Freeman C | 12 |
| Haynes, Lewis L | 1329 |
| Health, National Institutes of; National Cancer Institute of the, U. S. Public Health Service | 1541 |
| Heaton, Leonard D | 403 |
| Heffernon, George A | 46 |
| Henderson, Arvin T | 222, 1499 |
| Hill, Robert L | 495 |
| Hirst, Robert R | 902 |
| Hoagland, Robert J | 562 |
| Holmes, Robert H | 443, 1483 |
| Horton, Samuel H., Jr | 668 |
| Howe, Paul E | 694 |
| Huebsch, Raymond F | 1425 |
| Hullinghorst, Robert L | 1299 |
| Hyatt, George W | 841 |
| IMPERIALE, Louis E | 615 |
| JAMES, Arthur A | 938 |
| Johnson, Allen S | 422 |
| Johnson, Carl M | 596 |
| Johnson, Fenimore T | 553 |
| Johnson, Louise M | 1511 |
| Johnson, Robert E | 615 |
| Johnson, Spencer | 205 |
| KAESS, Karl V | 325 |
| Kahn, G. Mason | 886, 1455 |
| Kark, Robert M | 615 |
| Keegan, Hugh L | 321 |
| Kellsey, David C | 806 |
| Kelly, Ellsworth K | 311 |
| Kempton, George B | 222 |
| Kimbrough, James C | 1411 |
| King, John H., Jr | 665 |
| Knight, Ralph T | 58 |
| Kooda, Jennings C | 1189 |
| Kretschmer, Ernest T | 1517 |
| Kuhns, Dwight M | 861, 1511 |
| Kulowski, Jacob | 654 |
| Kuttler, Kenneth L | 920 |
| LACASSE, Walter J | 812 |
| Lacer, Karl M | 886 |
| Langdon, Edward | 210 |
| Laudani, Angelo | 615 |
| Lawler, Arthur L | 902 |
| Lawrence, Richard, Jr | 1399 |
| Leffler, Raymond J | 1503 |
| Legerton, Clarence W | 88 |
| Legge, Robert F | 514 |

| | Page |
|---|---|
| Leibovitz, Albert | 1265 |
| Letterman, Gordon S | 165 |
| Lewis, Robert B | 146 |
| Lingenfelder, John | 550 |
| Long, Perrin H | 928, 1001, 1109, 1273 |
| Lyons, Harold A | 30, 583 |
| MACFIE, J. M | 1219 |
| MacGregor, John B | 648 |
| Maloney, Mary A | 615 |
| Manson, William W | 586, 1437 |
| Mantell, Louis K | 733 |
| Marsh, William C | 1045, 1105 |
| Mathieu, Thomas J | 1051 |
| Maxcy, Kenneth F | 1007 |
| McCARTNEY, James L | 91 |
| McConkie, Howard S | 945 |
| McNicol, Campbell A | 1489 |
| Meeter, Urquhart L | 292 |
| Meloy, William C | 165 |
| Mendelson, Ralph W | 781 |
| Merikangas, Urho R | 1 |
| Miller, Joseph M | 853 |
| Millspaugh, Judson A | 1035 |
| Molnar, Charles J., Jr | 629 |
| Morgans, Philip M | 1483 |
| Morrison, Howard J | 1473 |
| Moschella, Samuel L | 409, 527 |
| Mowrey, Fred H | 1179 |
| Moseley, Harry G | 1249 |
| Moxon, Robert K | 1157 |
| Murnane, Thomas G | 785 |
| Murphy, Leslie C | 415, 920 |
| Myers, Paul W | 562 |
| NOLAN, Joseph D | 115 |
| Novy, Frederick G | 778 |
| O'CONNELL, Hugh V | 719 |
| Olitsky, Peter K | 415, 920 |
| Oliver, Samuel H | 336 |
| PARKER, John A | 913 |
| Parker, Ralph C., Jr | 332 |
| Parrack, Horace O | 449 |
| Pedigo, Howard K | 280 |
| Perry, Ben F | 773 |
| Peters, Earl R | 1051 |
| Peyton, Alton B | 733 |
| Powell, Clifford P | 578 |
| Prezyna, Anthony P | 866 |
| Pulaski, Edwin J | 1447 |
| RAFFERTY, James A | 22 |
| Raftery, Alan | 413, 540 |
| Ramsay, Allan B | 1307 |
| Ransom, John P | 818 |
| Ranson, Stephen W | 1379 |
| Ratcliffe, Harold E | 957 |
| Ravdin, Isidor S | 257 |
| Redfield, Ernest S., Jr | 1313 |
| Redish, Milton H | 447 |
| Reiner, Donald E | 403 |
| Richards, Ralph J., Jr | 121, 1235 |
| Robinson, Paul I | 121, 227, 358, 483, 602, 821, 1359, 1363, 1537 |
| Rounds, Roy C | 173 |
| Ryan, Thomas C | 30 |
| Rydeen, John O | 682 |
| SALYER, John M | 738 |
| Sanders, Arvey C | 1299 |
| Sarkisian, Sarkis S | 1021, 1095, 1281 |
| Sborov, Victor M | 546 |
| Scheibel, Arnold B | 557 |
| Schiff, Maurice | 979 |
| Schmidt, Arthur H | 1465 |
| Schmidt, Richard T. F | 874 |
| Schwartz, Jack W | 292 |
| Schwingel, William H | 514 |
| Scott, Michael J | 1017 |
| Segal, Martin L | 225 |
| Shaeffer, Joseph R | 1447 |
| Shaffer, Francis W | 1027, 1435 |
| Shaul, John F | 437 |
| Shaw, Christopher C | 1199 |
| Sherrill, James W | 1399 |
| Shiveley, John A | 505 |
| Smith, Ancil B | 1285 |
| Sokal, Joseph E | 1167 |
| Stoecklein, Herbert G | 886 |
| Stonestreet, Marshall P | 985 |
| Stoolfire, Arthur W | 648 |
| Strother, Robert B | 275, 1185 |
| Sumner, John W., Jr | 218 |
| Super, Janice | 1151 |
| Swain, Harmon L | 615 |
| Szmyd, Lucian | 107 |
| TARROW, Arthur B | 58 |
| Thiemeyer, John S., Jr | 543 |
| Thomas, David E | 433 |
| Thompson, Ollie H | 413 |
| Thomson, Joseph J. C | 225 |
| Tornetta, Frank J | 424 |
| Towner, Alonzo A | 317 |
| Tyson, Arthur M | 39 |


THE ARMY LIBRARY
WASHINGTON, D.C.

| | Page |
|---|---|
| WALKER, Weldon J | 393 |
| Webb, Gilbert | 521 |
| Weinbaum, Jerome A | 874 |
| Wetherbee, Donald G | 861, 1511 |
| Wickstrom, Otto W | 1141, 1425 |
| Wilets, Arthur J | 296 |
| Williams, James N | 687 |
| Williams, Raymond M | 778 |
| Williams, Robert P | 997 |
| Williams, William T | 881 |
| Wilson, William L | 462 |
| Wiper, Thomas B | 853 |
| Wolfe, Henry E., Jr | 205 |
| Woodruff, Whitney | 424 |
| Wright, Wayne L | 570 |
| YAGER, Robert H | 415, 920 |
| Yates, Marion T | 759 |
| Young, Donald C | 222, 1499 |
| ZELUFF, Reginald J. M | 26 |
| Zuska, Joseph J | 773 |